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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 2
JANUARY 15, 1972

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A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

THEORETICAL EVIDENCE AGAINST THE EXISTENCE OF POLYWATER,
Princeton Univ., N.J. Dept. of Chemistry.
L. C. Allen, and P. A. Kollman.
Nature, Vol 233, No 5321, p 550-551, October 22, 1971. 5 ref.

Descriptors: *Water types, *Water chemistry, *Water properties, *Water structure, *Gels, Laboratory tests, Test procedures, Oxides, Silica, Condensation, Theoretical analysis.
Identifiers: *Polywater, *Anomalous water.

The basis for reversal of earlier reported opinions by the authors from the existence to the nonexistence of polywater is presented. The original structure model which provided a scheme for rationalizing the many diverse properties of polywater consisted of stacked layers built from hexagonal units, composed of symmetrical hydrogen bonds as proposed on qualitative grounds by Lippincott et al. The resulting three-dimensional polywater lattice is to ice I as graphite is to diamond, and it was found to be metastable with respect to the normal liquid. To test whether or not this model could exist as a metastable state, the smallest representative group of atoms--a single hexagonal unit (H2O)6 with hydrogen atoms symmetrically placed around the ring between the oxygen atoms--was studied with initial molecular orbital calculations augmented by zero point and correlation energy corrections. Analysis of the errors inherent to the semiempirical method reveals that its tendency to produce too short bond distances, in such cases as the O...O separation in the water dimer, leads to an unrealistic lowering of the total energy for symmetrical hydrogen bonds. (Woodard-USGS)
W72-00574

02. WATER CYCLE

2A. General

OSCILLATORY KERNEL FUNCTIONS IN LINEAR HYDROLOGIC MODELS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
D. Blank, J. W. Delleur, and A. Giorgini.
Purdue University Water Resources Research Center Report, 1971. 10 fig, 1 tab, 12 ref, append. Project B-008-IND (2) and A-001-IND (5).

Descriptors: *Rainfall-runoff relationships, *Mathematical studies, *Input-output analysis, *Hydraulic models, Hydrologic data, Hydrologic equation, Hydrographs, Analytical techniques, Theoretical analysis.
Identifiers: Kernel oscillations, Convolution integral.

The rainfall-runoff relation was expressed by the convolution integral; the kernel function was evaluated by Fourier and Laplace-Gamma transforms and by the direct method. Three analytical examples (known kernels) were analyzed and used to compare the effectiveness of these methods. For a third of the storms measured in the field, oscillatory kernels were derived. The oscillations were not necessarily due to nonlinearities but could arise from random noise in the data. An error analysis shows that small errors in the output values may result in large perturbations in the kernel function. Low-pass digital filtering of input (excess rainfall) and output (direct runoff) eliminated the kernel oscillations in most cases. The cutoff frequency was approximately at the sampling frequency. Accurate output reproduction was obtained by convolution of either the original kernel, the smoothed kernel, or the kernel resulting from the filtered data. (Woodard-USGS)
W72-00584

PRELIMINARY DIGITAL MODEL STUDIES OF THE RIO ACONCAGUA VALLEY, CHILE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F
W72-00606

WATER RESOURCES INVESTIGATION PROGRAM FOR RIO ACONCAGUA VALLEY, CHILE,
Geological Survey, Denver, Colo.
J. E. Moore.
Geological Survey Open-file Report, December 1969. 59 p, 15 fig, 2 tab, 10 ref, 3 append.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Hydrologic data, *Surveys, Water yield, Aquifer characteristics, Withdrawal, Water users, Irrigation, Streamflow, Hydrogeology, Groundwater movement, Model studies, Water table, Groundwater recharge.
Identifiers: *Rio Aconcagua Valley (Chile).

Data concerning water resources in Rio Aconcagua Valley, Chile, are presented. The Rio Aconcagua valley is the second most productive irrigated valley in Chile. The valley extends from the Andes to the Pacific Ocean and lies about 100 km (kilometers) north of Santiago. The western part is the agricultural area. The major crops grown are grapes, fruits, corn, and garden vegetables, mostly for the Santiago market. The irrigated part, which is the main agricultural area, extends from Chacabuquito to the ocean, a distance of 113 km. The total irrigated area is 70,000 hectares. This includes the main valley and four large tributary valleys. The valley and its tributaries are underlain by an alluvial aquifer composed of sand, gravel, and clay. The Rio Aconcagua is hydraulically connected with the aquifer in most of the valley and is, in most years, a gaining stream. The total area of the alluvial aquifer is about 115,000 hectares. The aquifer ranges from 1 to 13 km wide and averages about 3 km. The irrigation water supply depends primarily on snowmelt from the Andes Mountains. The mean annual precipitation in the irrigated area is only about 30 cm (centimeters). Some of the applied water recharges the alluvial aquifer and appears in the river as return flow. (See also W72-00606) (Woodard-USGS)
W72-00609

SCS NATIONAL ENGINEERING HANDBOOK, SECTION 4, HYDROLOGY,
Soil Conservation Service, Washington, D. C. Hydrology Branch.
For primary bibliographic entry see Field 04A.
W72-00792

WATER BALANCE OF THE GREATER CAUCASUS (VODNYY BALANS BOL'SHOGO KAVKAZA),
L. A. Vladimirov.
Izdatel'stvo 'Metsniyereba', Tbilisi, 1970. 144 p.

Descriptors: *Water balance, *Mountains, *Orography, Precipitation (Atmospheric), Evaporation, Subsurface runoff, Subsurface flow, Surface runoff, Runoff coefficient, Streamflow, River basins, Slopes, Glaciers, Snow, Groundwater, Groundwater recharge, Regions, Elevation, Hypsometric analysis, Maps.
Identifiers: *USSR, *Caucasus, *Greater Caucasus, Mountain basins, Lowlands, Regionalization.

Established relations of precipitation, runoff, evaporation, and subsurface runoff to the average elevation of a basin or height zone were used to compile the water balance of the Greater Caucasus, excluding Azerbaydzhan and the Dagestan ASSR. Three natural height zones were identified: (1) the lowland and low-mountain zone (0-1,000 m); (2) the medium-mountain zone (1,000-2,000 m); and (3) the high-mountain zone (above 2,000 m). Average annual precipitation for the mountainous areas is 1,160 mm, of which 686 mm or 59% reaches the ground surface and 510 mm or 44% becomes evaporation. Streamflow is 648 mm and consists of 73% surface flow and 27% subsurface flow. An annual total of 140.8 cu km of precipitation occurs over the area of 121,600 sq km. The amount of precipitation reaching the ground is 78.8 cu km, of which 57.4 cu km is surface flow and 21.4 cu km, subsurface flow. The amount of precipitation lost to evaporation is 62.0 cu km. Extensive numerical data are presented along with a map of the regionalization of the Greater Caucasus. (Josefson-USGS)
W72-00812

STOCHASTIC MODELLING OF STORM PRECIPITATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02B.
W72-00836

2B. Precipitation

SHIELDING PRECIPITATION GAGES FROM ADVERSE WIND EFFECTS WITH SNOW FENCES,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. W. Larson.
Available from the National Technical Information Service as COM-71-01040, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No 25, 161 p, 63 fig, 24 tab, 53 ref, 3 append. OWRR A-001-WYO (51).

Descriptors: Blizzards, *Climatic data, Correlation analysis, Equipment, Hydrologic, Data, *Precipitation gages, Rainfall, Regression analysis, Snow, Snowfall, Statistics, Storms, Weather data, Winds, *Windbreaks, Data collections.
Identifiers: *Snow fences, Wind tunnel analysis, Snow drift data.

The development and operation of a research project designed to investigate the possibility of shielding precipitation gages from adverse wind effects by using artificial wind barriers, such as snow fences, is described. A description is given of the project including an extensive literature review, installation and site development, data collection and processing for precipitation, wind, and snow drift data, recommendations, and conclusions. Also included is a description of a wind tunnel analysis of one of the test gage configurations. The general conclusion is that under the conditions encountered during this study, snow fences can be used to protect precipitation gages from adverse wind effects when measuring winter precipitation.
W72-00639

THE EARTH'S GASEOUS HYDROSPHERE AS A NATURAL RESOURCE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
V. P. Starr, and D. A. Anati.
Nordic Hydrology, Vol 2, No 2, p 65-78, 1971. 3 fig, 6 ref. NSF Grant GA-1310 X.

Descriptors: *Condensation, *Precipitation (Atmospheric), *Convection, *Artificial precipitation, *Artificial storms, Cloud physics, Water sources, Humidity, Atmospheric physics, Atmospheric pressure, Air temperature.

Water vapor of the atmosphere is a potential resource for the extraction of fresh liquid water by artificial means. One method for doing this is analyzed from the standpoint of simple dynamic calculations, using meteorological data taken in the Middle East and the Gulf of Mexico. The method consists of the generation by a convection tower of a captive and controlled miniature rainstorm. It may also be used as a means for the desalinization of sea water. (Knapp-USGS)
W72-00833

STOCHASTIC MODELLING OF STORM PRECIPITATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
S. Ramaseshan.
Nordic Hydrology, Vol 2 No 2, p 109-129, 1971. 9 fig, 3 tab, 5 ref.

Descriptors: *Precipitation (Atmospheric), *Storms, *Stochastic processes, *Mathematical models, Statistical models, Time series analysis, Storm runoff, Linear programming, Markov processes, Probability.

The distribution of precipitation in time during storms constitutes a complex stochastic process. Mathematical modelling of the process is quite difficult. The process is conceived as a finite-duration, quantitized-data, continuous-variable, stochastic process that can be represented as a finite time series. The details of formulating and fitting a suitable stochastic model for the process are given, and the steps are illustrated with an example. These may be useful for the study of transient stochastic processes such as floods, droughts, earthquakes, and squalls, and for the design of engineering systems to resist or control such processes. (Knapp-USGS)
W72-00836

BOARD PLANS WEATHER MODIFICATION RESEARCH PROGRAM IN SAN ANGELO AREA.
Texas State Water Development Board, Austin.

Water for Texas p 5-7, January 1971. 3 fig.

Descriptors: *Cloud seeding, *Weather modification, *Droughts, *Rainfall, Texas, Evaluation, Aircraft, Radiosondes, Rain gages.
Identifiers: Texas Water Development Board, Concho River basin.

The Texas Water Development Board and the Bureau of Reclamation began cloud-seeding experiments in the Concho River basin above San Angelo to boost rainfall in the drought-stricken area. Techniques for modification of the warm rain process will be developed, and recent cold-cloud seeding techniques will be tested and evaluated. Two aircraft, radar radiosonde, raingages, condensation-nuclei counter and computer-terminal link are the required equipment. (Popkin-Arizona)
W72-00880

A COMPARATIVE STUDY OF RAINFALL INTERCEPTION BY GROUND LITTER IN A HARDWOOD, A RED PINE, AND A MIXED CONIFEROUS STAND,
Maine Univ., Orono. Dept. of Forest Resources.
For primary bibliographic entry see Field 02I.
W72-00890

THE MEASUREMENT OF RAINFALL BY RADAR AND SATELLITES,
Council for Scientific and Industrial Research Pretoria (South Africa).
F. J. Hewitt.
South African Journal of Science, Vol 67, No 3, p 183-190, March 1970. 3 fig, 1 tab, 12 ref.

Descriptors: *Weather data, *Radar, *Rainfall, *Rain gages, Instrumentation, Weather patterns, Remote sensing, Data collections, Data processing, Satellites (Artificial).

Radar measurement of rainfall over large areas may be much more economically feasible than networks of rain gauges. A single radar set, for instance, can measure the total rainfall, in 5 minute intervals, in each square kilometer in a 30,000 or more square kilometer catchment area, and the results are immediately available at the observing center. Additionally, the accuracy of gauges is open to question because local topography can introduce wide variation in relatively close locales. One study indicates that 25 rain gauges would be necessary to give results comparable to radar in a 2500 square kilometer area. The theory and practice of radar rainfall observations are discussed. The echo received from radar coming from a volume of rain depends on the shape and range of the radar beam and the pulse length. The reflectivity of the beam is proportional to the 1.6 power of the rainfall rate. Practical problems concerning power calibration and attenuation of the waves by other rains existing between the rainfall measure and the beam source are considered. Satellite observations do not have sufficient resolution to compete with ground based networks in regional studies but may have much use in global measurements. (Casey-Arizona)
W72-00894

2C. Snow, Ice, and Frost

SPATIAL CORRELATION BETWEEN THE WIND VELOCITY NEAR THE SOIL SURFACE AND THE SNOW COVER DURATION, (IN GERMAN),
Aussenstelle Subalpine Waldforsch., Forstl. Bundesversuch-sanst., Innsbruck, Austr. Forstliche Bundesversuchsanstalt, Innsbruck (Austria). Aussenstelle fuer Subalpine Waldforschung.
Herbert Kronfuss.
Centralbl Forstw. 87 (2): 99-116. Illus. Maps. 1970. English summary.
Identifiers: Cover, Duration, Snow, Soil, Spatial, Surface, Velocity, Wind.

If wind velocity near the soil surface is to be represented in a way easy to survey for a sloped terrain with accentuated relief forms, point measurement will never lead to an end: the intensity of ground wind varies considerably according to the situation of the site within the relief. The mean values of wind velocity obtained for individual sites within the terrain need an arranging system of guiding lines oriented by both relief and wind conditions. This is accomplished with isochions (lines of equal snow cover duration). For a number of sites at which wind velocity was measured near the soil surface, mean snow duration values have been adequately drawn from a snow duration map.--Copyright 1971, Biological Abstracts, Inc.
W72-00701

CONTRIBUTION TO THE ECOLOGICAL STUDY OF SUB-ANTARCTIC ENVIRONMENTS: III. HYDROLOGICAL STUDIES OF FRESHWATER AND MARINE ENVIRONMENTS OF THE BAY OF MORBIHAN REGION (KERGUELEN ARCHIPELAGO), (IN FRENCH),
Institut Bouisson Bertrand, Montpellier (France).
E. Lagarde, J. P. Menet, and R. Lesel.
Nature Can. 97 (6): 783-803. Illus. Maps. 1970. English summary.
Identifiers: Antarctic, Archipelago, Bay, Ecological, Environments, Fresh, Hydrological, Kerguelen, Marine, Minerals, Morbihan, Salinity, Temperature.

The hydrological study of 2 marine biotypes and 1 freshwater biotope from the Port-aux-Francais area (Kerguelen Archipelago) was undertaken from June 1967 to March 1968. The physiocochemical calculations: temperatures, pH, rH, salinity, P.PO4--, S.SO4--, N.NO3-, Na.., K.., Ca...., Mg...., allowed a precise definition of the hydrological state of 2 sea stations, located one at the end of a long fjord directly subjected to the influence of meteorological factors peculiar to this area (Baudissin sound), the other at the limit of the waters of Morbihan bay and the open sea (Royal pass). Additional hydrological researches on a freshwater biotope allowed a study of exchange between soft waters and suggested an explanation for some of the observed ionic changes.--Copyright 1971, Biological Abstracts, Inc.
W72-00710

FEATURES AND MEASUREMENTS OF DEEP POLAR ICE CORES OBTAINED BY VARIOUS DRILLING METHODS,
Regions Research and Engineering Lab., Hanover, N.H.
C. C. Langway, Jr.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N.H. September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 77, 1970.

Descriptors: *Core drilling, *Cores, *Ice, *Glaciers, Equipment, Instrumentation, Sampling, Subsurface investigations, Borehole geophysics, Drilling equipment.
Identifiers: Ice coring.

Three different methods of deep core drilling into polar ice sheets are used by U.S.A. CREEL's drilling teams: mechanical-rotary, thermal and electro-mechanical. Each method has advantages depending upon the planned investigations. Harmful contamination problems arise when it is necessary to use fluids to prevent hole closure at depth. Mechanical-rotary boring using cooled compressed air as the drilling fluid appears to provide the best uncontaminated and physically undisturbed cores from the near surface down to about 300 to 400 m. All physical and chemical studies are possible on these cores (10 cm diam.). Thermally-bored cores (13 cm diam.) have been obtained down to 500 m, however, the porous firn interval is physically and chemically altered during the thermal process. Stratigraphy, density, fabrics and grain size measurements are not meaningful until the permeability approaches zero, although some isotope studies are possible in the upper altered cores. Electromechanically obtained cores (10 cm diam.) have been recovered from a complete ice sheet profile, including 4 m into sub-ice material. (Knapp-USGS)
W72-00768

PRELIMINARY RESULTS OF STUDIES OF ICE CORES FROM THE 2164 M DEEP DRILL HOLE, BYRD STATION, ANTARCTICA.
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. J. Gow.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 78-90, 1970. 9 fig, 21 ref.

Descriptors: *Cores, *Ice, *Glaciers, *Antarctic, *Sampling, Boreholes, Core drilling, Crystallography, Temperature, Movement, Melting, Sediments, Heat flow.
Identifiers: Byrd Station (Antarctica), Core holes.

The Antarctic ice sheet at Byrd Station has been core drilled to bedrock. The vertical thickness of ice was 2,164 m and a core yield of more than 99% was achieved. Liquid water--indicative of pressure melting--was encountered at the bed. Horizontally banded debris, including layers of clay, sand and pebbles and some larger fragments of granite is present in the basal ice. A temperature minimum of -28.9 deg C was recorded at 800 m depth and the heat flow through the bottom of the ice sheet is estimated at 1.8 microcal per sq cm per sec. A maximum in situ density of 0.9206 g per cc was measured at 1000 m. Several thin layers of dirt observed between depths of 1300 and 1700 m were tentatively identified as volcanic ash believed to have been deposited from nearby volcanoes between 15,000 and 25,000 years ago. Typically bubbly ice reverted to a bubble-free condition between 900 and 1200 m depth. A very rapid increase in the size of crystals below 1800 m (crystal cross-sections of 30 sq cm are not uncommon) is attributed to annealing at elevated temperatures near the bottom of the ice sheet. Electrolytic conductivity measurements of melted samples revealed very low levels of dissolved solids at all depths in the ice sheet. (Knapp-USGS)
W72-00769

GASES ENTRAPPED IN ICE: A PRELIMINARY REPORT ON THE STUDY OF TWO VERTICAL PROFILES IN TERRE ADELIE, ANTARCTICA,
Centre National de la Recherche Scientifique, Boulogne (France).
D. Raynaud, C. Lorius, G. Ducheylard, and R. Botter.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 91-92, 1970. 6 ref.

Descriptors: *Ice, *Antarctic, *Glaciers, *Bubbles, *Gases, Sampling, Oxygen, Nitrogen, Carbon dioxide, Shear, Pressure, Stable isotopes.
Identifiers: *Gas bubbles (Glacial).

Preliminary data from two drill holes about 100 m deep in the coastal region of Terre Adelie (approximately 66 deg 40's and 140 deg E) are presented. The first drill hole is in the ablation zone and the second is in the accumulation zone. There is a clear increase in the number of bubbles below 30 m. The ice at depths above 30 m appears to have formed locally while the deeper ice has a more distant origin. The increase in trapped bubbles was accompanied by the development of a preferred crystal orientation and by an increase in the average crystal cross-sectional area. This grain growth was interrupted in discontinuous zones that had undergone much shearing. This interpretation was also suggested by the abrupt variations observed in the stable isotope content of these zones. Substantial differences were seen between the composition of the gases trapped in ice and that of atmospheric air. In particular, the concentration ratio (N/O) was higher in ice and this ratio increased with depth. Fractionation might possibly take place as a result of physico-chemical processes which occur during the formation of bubbles. Fractionation appears to be greater near the bottom of the drill hole, particularly in the zone where the appearance of ice of a more distant origin is observed. (Knapp-USGS)
W72-00770

OXYGEN ISOTOPE ANALYSIS OF A CORE REPRESENTING A COMPLETE VERTICAL PROFILE OF A POLAR ICE SHEET,
Copenhagen Univ. (Denmark). Physics Lab (II).
W. Dansgaard, S. J. Johnsen, J. Moller, and C. C. Langway, Jr.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 93-94, 1970. 1 fig.

Descriptors: *Glaciers, *Ice, *Stable isotopes, *Paleoclimatology, Cores, Sampling, Oxygen, Temperature, Movement, Strain, Stratigraphy, Boreholes.
Identifiers: *Camp Century (Greeland), Core holes.

Theoretical considerations related to the Camp Century, Greeland, deep ice core suggest that annual accumulation can be estimated for the last 7000 years by interpreting seasonal stratigraphic oxygen isotope differences. The presently available Camp Century data show the accumulation to have been essentially the same as today back to at least 600 years BP. The long periodic variations in isotope ratios remain practically undistrubed for a much longer time. The average isotopic composition of sections representing many years reflects climatic changes at least 70,000 years back in time. These data agree with other independent determinations of past global climatic changes and indicate that isotopic core studies are an important tool in chronological climatology. (Knapp-USGS)
W72-00771

RADIO ECHO EXPLORATION OF THE ANTARCTIC ICE SHEET,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin, C. W. M. Swithinbank, and B. M. E. Smith.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 97-115, 1970. 10 fig, 3 tab, 25 ref.

Descriptors: *Glaciers, *Antarctic, *Sounding, *Radar, *Ice, Depth, Movement, Topography, Subsurface investigations, Mapping, Profiles, Cross-sections, Remote sensing, Terrain analysis, Instrumentation.
Identifiers: *Antarctica.

Radio-echo profiling provides a rapid means of exploration of the major part of polar ice sheets. Some limitations in the effectiveness of the techniques arise from the dielectric absorption of radio wave energy which increases rapidly with increase of ice temperature, so that the application of the method to temperature glaciers has yet to be proven. The ability to follow reflecting horizons within the ice mass yields much knowledge of the way in which the ice deforms and flows in large ice sheets. Flights ranged form the highest central dome of the Antarctic ice sheet, where the losest ice temperatures are found, to the relatively warm ice at latitudes around 67 degrees S. (Knapp-USGS)
W72-00772

MEASUREMENTS OF ELECTROMAGNETIC WAVE VELOCITY IN THE EAST ANTARCTIC ICE SHEET,
Wisconsin Univ., Madison. Dep. of Geology and Geophysics.
J. W. Clough, and C. R. Bentley.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 115-128, 1970. 10 fig, 9 ref. NSF Grant GA-552.

Descriptors: *Glaciers, *Ice, *Antarctic, *Sounding, *Radar, *Velocity, Depth, Stratification, Remote sensing, Instrumentation, Subsurface investigations, Mapping.
Identifiers: *Electromagnetic wave velocity.

Several measurements of electromagnetic wave velocity in the ice of Dronning Maud Land were carried out by means of wide-angle reflection profiling and comparison of electromagnetic and seismic echo times. The mean velocity is 171 plus or minus 2 m/microsec, corresponding, for a temperature of -10 deg C, to a dielectric constant of 3.12 plus or minus .05. This value agrees with some field measurements made elsewhere on polar ice, but is significantly different from some others. Echo time comparisons probably indicate that a major portion of the ice sheet is strongly anisotropic. The existence and horizontal continuity of at least 15 internal reflectors at depths between 250 and 1,250 m is confirmed. (Knapp-USGS)
W72-00773

SEISMIC ANISOTROPY IN THE WEST ANTARCTIC ICE SHEET,
Wisconsin Univ., Madison, Dept. of Geology and Geophysics.
C. R. Bently.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 128-130, 1970. 1 ref.

Descriptors: *Seismic studies, *Ice, *Glaciers, *Antarctic, *Anisotropy, Cryology, Crystallography, Velocity, Model studies, Shear, Crystal growth, Geophysics, Seismic properties.
Identifiers: *Antarctica, Ice crystals.

Seismic reflection and refraction measurements made during several traverses in west Antarctica provide clear indication of anisotropic seismic wave propagation in the ice sheet. These indications include marked increases in the refracted compressional and shear wave velocities at depths of hundreds of meters in the ice, dependence of the propagation velocities of waves reflected from the bottom of the ice on the angle of incidence and also on geographic azimuth, and a variation of shear wave propagation velocity with direction of polarization. All of these characteristics were also found for propagation through a single crystal of ice. An analysis of the velocity variations has therefore been made on the assumption that the ice at depth behaves approximately as a single crystal, or that there is perfect alignment of the c-axes. This is not, of course, a physically realistic assumption, but will give nearly the same elastic wave velocity structure as a random, or axially symmetric, distribution of c-axes within a cone having an apex angle of 30 degrees or less. (Knapp-USGS)
W72-00774

GLACIOLOGICAL RESEARCH ON THE INLAND TRAVERSE OF THE 8TH JAPANESE ANARTIC RESEARCH EXPEDITION,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
T. Ishida.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 130-138, 1970. 7 fig, 3 ref.

Descriptors: *Glaciers, *Ice, *Topography, *Antarctic, *Sounding, Surveys, Gravity studies, Movement, Rheology, Seismic studies, Depth.

During the traverse of east Dronning Maud Land, Antarctica, ice surface elevations were measured by altimetry and ice thicknesses were determined by a combination of gravity and seismic reflection measurements. The relation between ice and rock surface topography was investigated. In order to investigate the relation between snow surface- and rock-topography, spectra of snow surface slope and rock surface curves were computed. A striking similarity is seen between the two spectra. The surface slope curve determined from strain rates agrees very well with the observed surface slope curve. (Knapp-USGS)
W72-00775

STABILITY OF ICE SHEETS AS DEDUCED FROM DEEP TEMPERATURE GRADIENTS,
Scott Polar Research Inst. Cambridge (England).
G. de Q. Robin.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 141-151, 1970. 4 fig, 3 tab, 12 ref.

Descriptors: *Glaciers, *Geothermal studies, *Regimen, *Water balances, *Antarctic, Heat flow, Subsurface investigations, Boreholes, Borehole geophysics, Movement.
Identifiers: *Temperature gradients (Glaciers).

Analyses of deep temperature profiles provide a powerful means of examining the stability and past history of ice sheets. Although some of the estimates involved can only be approximate, the method has two great advantages over the method of equating total accumulation against mass outflow over a strain network. In the temperature analysis an error in accumulation is reproduced as a proportional error in the effective mass balance, while in the mass budget case the final answer depends on the arithmetical difference between two figures, and an error in accumulation rate or an error in mass outflow can produce disproportionately large errors. The second point is that the temperature analysis produces an answer for mean conditions over periods of the order of 1,000 years, compared with an answer covering the period of the survey only for mass budget methods. The way to obtaining much deep thermal data in this field now exists in the Philberth type of probe. (Knapp-USGS)
W72-00776

STEADY-STATE TEMPERATURE PROFILES IN ICE SHEETS,
Melbourne Univ., Parkville (Australia). Dept. of Meteorology.
U. Radok, D. Jenssen, and W. Budd.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 151-165, 1970. 10 fig, 12 ref.

Descriptors: *Glaciers, *Ice, *Geothermal studies, *Movement, *Regimen, Climates, Snowfall, Strain, Heat flow, Rheology, Cryology, Radar, Remote sensing.
Identifiers: *Temperature gradients (Glaciers).

In the vertical temperature profile through an ice sheet climatic effects are compounded with those of accumulation and strain rates, ice velocity and surface slope, ice thickness and geothermal heat flux. Computed profiles for diverse values of these glaciological variables are presented which provide a basis for isolating the climatic element in observed temperature profiles, and for estimating temperature-dependent quantities duch as ice flow law parameters and the dielectric absorption of radar signals in ice sheets. (Knapp-USGS)
W72-00777

A STUDY OF 10 M FIRN TEMPERATURES IN CENTRAL EAST ANTARCTICA,
Ohio State Univ., Columbus. Inst. of Polar Studies.
H. S. Kane.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 165-174, 2970. 7 fig, 1 tab, 6 ref. NSF Grants GA-236 and GA-1076.

Descriptors: *Glaciers, *Antarctic, *Climatology, Temperature, *Slopes, Mixing, Winds, Heat transfer, Heat balance, Heat budget, Heat flow, Turbulence, Meteorology, Orography, Topography.

Relationships between the Mean annual air temperature and topographical features in central East Antarctica were analyzed. All temperatures are derived from a series of measurements in boreholes of approximately 40 m depth. The measurements were made from 15 to 40 m and extrapolated to 10 m depth. Two areas were anomalously warm. The temperature in these areas decreases as elevation decreases, the reverse of the normally expected situation. The temperature anomaly is a function of the slope. An area of high slope corresponds to a warmer-than-expected temperature, and an area of low slope corresponds to a colder-than-expected temperature. There is an areal shift downslope of this relationship which may be a lag factor or phase shift. A multiple regression analysis on the data collected at 46 traverse stations indicates that the temperature is increased 2.16 deg C for each meter per kilometer of increase in slope. The mechanism for this warming appears to be turbulent mixing of the inversion layer cuased by slope-induced thermal winds. (Knapp-USGS)
W72-00778

A HEURISTIC NUMERICAL MODEL FOR THREE-DIMENSIONAL TIME-DEPENDENT GLACIER FLOW,
Geological Survey, Tacoma, Wash.
W. J. Campbell, and L. A. Rasmussen.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 177-190, 1970. 9 fig, 9 ref.

Descriptors: *Glaciers, *Movement, *Mathematical models, *Regimen, *Viscous flow, Shear stress, Strain, Model studies, Diffusion, Viscosity, Shear, Water balance, Deformation, Numerical analysis, Slopes, Profiles, Rheology, Cryology, Flow.
Identifiers: Glacier flow, Kinematic waves.

As a first step in the development of a mathematically tractable model for three-dimensional, time-dependent glacier flow, a Newtonian viscous flow law is assumed. The Navier-Stokes equation, with acceleration and inertial terms omitted, is integrated vertically to form a volume transport equation, which with the three-dimensional continuity equation for incompressible flow, forms a system of three equations in four unknowns. By assuming a linear relation between volume transport and bottom shear stress, one unknown is eliminated. Using an IBM-7094, the model was applied to two bed configurations--valley and cirque--with the same transverse profile. Several steady-state solutions were obtained by varying the mass-balance-versus-altitude input function, the ice viscosity, and the bed friction coefficient. Time-dependent motion was studied by imposing an arbitrary wave on a steady-state solution for the valley glacier and observing its deformation and diffusion and by imposing short period climate changes on the same steady-state solution. With these simple causative mechanisms, complex, three-dimensional, dynamic waves are generated. (Knapp-USGS)
W72-00779

THE RELATIONSHIP OF ICE THICKNESSES AND SURFACE SLOPES IN DRONNING MAUD LAND,
Wisconsin Univ., Madison.
J. E. Beitzel.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 191-203, 1970. 9 fig, 6 ref. NSF Grant 144-6002.

Descriptors: *Glaciers, *Movement, *Flow, *Antarctic, Slopes, Depth, Topography, Correlation analysis, Ice, Rheology, Cryology, Surveys, Gravity studies, Sounding, Statistical methods.
Identifiers: *Antarctica, Dronning Maud Land.

Detailed ice thickness, elevation and surface slope data in Dronning Maud Land, Antarctica, permitted the investigation of ice surface slopes as a function of ice thickness. While the ice surface profile taken over hundreds of kilometers agrees well with equilibrium profiles based on plastic flow laws, shorter wavelength features suggest a low power flow law. Along flow lines the ice surface slopes were in phase with bottom topography, and Robin's relationship incorporating the effects of longitudinal stress variations could be used to derive theoretical ice surface slopes from the ice thicknesses. Both a linear flow law and a fourth power flow law were tried. The linear law provided better agreement with observations nearer the top of the ice cap. A power spectra analysis suggests that Budd's theoretical amplitude ratio function for ice surface slope and bottom slope values is in agreement with some of the field measurements. (Knapp-USGS)
W72-00780

THE FLOW LAW OF COLD ICE; INVESTIGATIONS ON MESERVE GLACIER, ANTARCTICA,
Ohio State Univ., Columbus. Inst. of Polar Studies.
G. Holdsworth, and C. Bull.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 204-216, 1970. 4 fig, 2 tab, 15 ref. NSF Grants GA-205 and GA-532.

Descriptors: *Glaciers, *Rheology, *Temperature, Stress, Strain, Antarctic, Ice, Cryology, Boreholes, Tunnels, Sampling, Regimen, Crystallography, Shear, Pressure, Plasticity, Viscosity, Deformation.
Identifiers: *Strain rate (Glaciers).

Measurements were made of the deformation of boreholes, of tunnels along the bed, and of horizontal circular holes cut in the walls of the tunnels, in the Meserve Glacier, Antarctica. In these holes the ice is at about -18 degrees C. At shear stresses of less than 0.5 bar the shear strain rate-shear stress relationship is best expressed as a power law with an exponent of 1.9. At shear stresses above 0.6 bar as the base of the glacier is approached, the exponent increases to about 4.5. This preliminary analysis assumes pure shear below the mid-depth of the glacier. Plotting the tunnel and core hole closure strain rates against hydrostatic pressure also indicates a significant increase in the exponent of the flow law, from 1.6 to 4.3 at a point just above the base of the glacier. This change in the flow properties of the ice may be associated with a salt-rich layer of ice which extends to about a meter above the base of the glacier. (Knapp-USGS)
W72-00781

ICE FLOW LAW FROM ICE SHEET DYNAMICS,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
L. A. Lliboutry.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 216-228, 1970. 3 tab, 44 ref.

Descriptors: *Ice, *Glaciers, *Rheology, *Anistropy, *Reviews, Flow, Cryology, Regimen, Stress, Strain, Shear, Non-newtonian flow, Plasticity, Vixcosity, Creep, Pressure, Temperature, Crystallography.
Identifiers: Glacier flow laws.

The usual assumptions in ice flow theory are listed. Laboratory values of the constants involved in the ice flow law are reviewed; they are so conflicting that values deduced from the flow of actual ice sheets are desirable. Present studies of the dynamics of grounded ice sheets and ice shelves are reviewed. All the data are reduced to reference values of -13 deg C and 0.5 bar. It appears that the strain rate of very old Greeland ice is larger than the strain rate of artificial isotropic ice or of ice shelves by a full order of magnitude, the values for small local ice caps lying between both. It is concluded that previous anistropy (not induced by local stresses) must be taken into account in ice sheet flow theory. (Knapp-USGS)
W72-00782

SOME ASPECTS OF SHALLOW SNOW METAMORPHISM AT SOUTHICE, ANTARCTICA,
University Coll. of Townsville (Australia). Dept. of Geology.
P. J. Stephenson.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 231-242, 1970. 4 fig, 2 tab, 10 ref.

Descriptors: *Snow, *Firn, *Ice, *Crystal growth, *Cryology, Antarctic, Mass transfer, Compaction, Density, Glaciers, Snowpacks, Stratigraphy.
Identifiers: *Snow metamorphism, Antarctica, Southice.

Stratigraphy and petrology of snow and firn were studied at Southice, Antarctica. A wide range of density remained to a depth of 6 m in spite of progressive densification. Near this depth, collapse of depth-hoar and other lower-density layers occurred. Deeper densities showed progressive convergence. Crystal size increased from 0.006 sq mm at the surface to more than 2 sq mm at 45 m. Systematic stratigraphic variations in crystal size and crystal shape occurred in the first meter. Deeper firn showed a convergence in the crystal shape parameter to approximately 1:55. The major agent in shallow metamorphism is vapor transfer under temperature gradients. In the zone adjacent to the surface the contrast in metamorphic style in summer and winter is due to gradients being negative and positive respectively. Vapor transfer and

precipitation produces the vertical grain structure by a selection process controlled by temperature patterns within the grains themselves. Condensation growth dominates in shallow material while growth by boundary migration predominates at deeper levels. (Knapp-USGS)
W72-00783

COMPARATIVE SNOW STUDIES ON THE ANTARCTIC AND GREENLAND ICE SHEETS,
Alaska Univ., College. Geophysical Inst. of Water Resources.
C. S. Benson.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 242-253, 1970. 5 fig, 2 tab, 15 ref.

Descriptors: *Snow, *Stratigraphy, *Arctic, *Antarctic, *Snowpacks, Temperature, Snowfall, Winds, Cores, Tunnels, Sampling, Density, Strength, Cryology.
Identifiers: Antarctica, Greenland.

The stratification exposed on the long tunnel walls during construction of New Byrd Station, Antarctica, was studied in the 1961-62 austral summer. The well-exposed sequences of strata showed good lateral continuity. Annual increments of accumulation were in the range of 17 plus or minus 3 g per sq cm per yr. The rate of accumulation appears to have changed from about 20 g per sq cm per yr between 1947 and 1954 to about 14 g per sq cm per yr from 1955 to 1961. It is possible that this variation is caused by migrating surface topography, which produces a variable rate of accumulation at a given station, even though the rate of snowfall remains constant. This may be an important complication in the interpretation of core obtained from deep drilling. The snow at Byrd Station was compared with snow at six stations on the Greenland Ice Sheet with comparable mean annual temperatures and rates of accumulation. Differences in the upper 6 m of snow strata, at the Antarctic and Greeland stations are interpreted as caused by differences in wind action and range of temperature. Byrd Station is windier and has a smaller temperature range; these differences favor the development of harder, denser snow. (Knapp-USGS)
W72-00784

SNOW ACCUMULATION OVER ANTARCTICA,
Newcastle-upon-Tyne Univ. (England). Dept. of Geography.
J. C. Chorlton, and H. Lister.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 254-263, 1970. 6 fig, 4 ref.

Descriptors: *Snowfall, *Antarctic, *Statistical models, *Regression analysis, Snowpacks, Water balance, Synoptic analysis, Climatology, Variability, Mapping.
Identifiers: *Antarctica.

Snow accumulation patterns over Antartica are described in terms of multiple regression equations. The variables in the equations are chosen by stepwise regression to give the best least squares fit possible. In Antarctica the accumulation and balance are similar due to small overall ablation. The balance of water equivalent is the dependent variable, which is expressed in terms of the geographic parameters: longitude, latitude, altitude, orientation of the slope, distance to the nearest ocean. The average accumulation over Antarctica is calculated to be between 14 and 16 cm of water equivalent. (Knapp-USGS)
W72-00785

RADIATIONBUDGET AT LITTLE AMERICA V, 1957,
Innsbruck Univ., (Austria). Inst. of Meteorology and Geophysics.
H. C. Hoinkes.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 263-284, 1970. 14 fig, 5 tab, 11 ref.

Descriptors: *Solar radiation, *Heat balance, *Albedo, *Antarctic, Climatology, Meteorology, Energy budget, Radiation, Cloud cover.
Identifiers: *Radiation budget.

The short-wave and long-wave radiation fluxes were measured at Little America V from March 1957 to January 1958. Results are given for the short-wave and long-wave radiation fluxes. Due to the high average albedo of 86 percent the net radiation budget of -6000 ly is dominated by long-wave radiation fluxes. Average daily variation is discussed for all four radiation fluxes. For the net budget beginning in October there is an average of eight to twelve hours of incoming net radiation during the day. Temperature of the snow surface was calculated from emitted long-wave radiation. In summer the daily variation of snow temperature is 8.5 deg C as compared to 3.4 deg C for ventilated air temperature at 1.7 meters. This leads to the development of instability at the height of the day. Differences in the results obtained during the same period at Scott Base are caused by differences in cloudiness temperature at the surface and aloft, and, most important, in albedo.
W72-00786

THERMAL PROPERTIES AND HEAT TRANSFER PROCESSES OF THE SNOW OF THE CENTRAL ANTARCTIC PLATEAU,
Alaska Univ., College. Geophysical Inst.
G. Weller, and P. Schwerdtfeger.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 284-298, 1970. 9 fig, 2 tab, 14 ref. NSF Grant GA-412.

Descriptors: *Heat transfer, *Snow, *Antarctic, Convection, Conduction, Radiation, Diffusivity, Cryology, Fourier analysis, Thermal properties, Thermal conductivity, Temperature.

Temperature measurements made in the snow at Plateau Station, Antarctica, during 1967 were analyzed using Fourier methods. The annual mean temperature at 10 m depth is -60.5 degrees C. An effective thermal diffusivity profile down to 10 m was computed by a method suggested for nonhomogeneous media, allowing for nonconductive processes in the snow. The actual thermal diffusivity of snow of density 0.42 g per cc at -60 degrees C is 0.0097 sq cm per sec. By comparison with other data a temperature coefficient of the thermal diffusivity of snow can be estimated as -0.01 degrees C. The nonconductive processes extend down to 8 m. These processes were examined directly by observations of the radiative and convective transfer of heat in the snow. The radiative effect is restricted to the upper two meters. The total subsurface heat transfer may be directed towards the snow surface for short periods even in winter and the annual amplitude at the surface is 8 cal per sq cm per day. (Knapp-USGS).
W72-00787

GLACIOLOGICAL EXPLORATION (ISAGE), ANTARCTIC.
International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, 1970. 543 p.

Descriptors: *Antarctic, *Glaciers, *Glaciation, *Conferences, Water balance, Hydrologic budget, Cryology, Rheology, Climatology, Regimen, Movement, Sounding, Instrumentation, Sea ice.
Identifiers: Antarctica.

The International Symposium on Antarctic Glaciological Exploration was held at Dartmouth College, Hanover, New Hampshire, from September 3-7, 1968. Fluctuations in the extent and thickness of icebergs and sea ice in the southern oceans has a profound effect on climatic variations throughout the world. No other single element on the earth with great effects on the heat budget is so variable from year to year, or from decade to decade. Another related subject deals with the Antarctic area as one of the earth's major heat sinks. Of about the same order in importance as continental heat loss is the great heat loss from the areas covered with sea ice. The topics discussed at the symposium were chemistry of accumulation and included particles, deep sounding techniques and results, thermodynamics, ice dynamics, meteorology, mass budgets, ice shelves, and sea ice. (See also W72-00818 thru W72-00827) (Knapp-USGS)
W72-00817

DATING OF FIRN LAYERS IN ANTARCTICA: APPLICATION TO THE DETERMINATION OF THE RATE OF SNOW ACCUMULATION,
Centre National de la Recherche Scientifique, Paris France).
C. Lorius, G. Lambert, R. Hagemann, L. Merlivat, and J. Ravoire.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 3-15, 1970. 8 fig, 28 ref.

Descriptors: *Snowpacks, *Antarctic, *Snowfall, *Radioactivity techniques, *Fallout, Tritium, Radioactive dating, Snow, Stratigraphy, Tracers, Radioisotopes.
Identifiers: *Snow accumulation rate (Antarctica).

Beta activity measurements on samples from Antarctica make it possible to calculate the mean snow accumulation rate by determining the radioactive fall-out reference horizon formed late 1954 and early 1955. At one station the accumulation rate was measured by means of tritium content measurements. The values that were obtained by the identification of a tritium reference horizon and from the decrease in the concentration of natural tritium are in good agreement with that derived from beta activity measurements. It seems that the accumulation rate generally accepted for the central regions of the Antarctic continent may be too high. However, the data presently available do not lead to significant modification of the estimate of the accumulation over the entire continent. (See also W72-00817) (Knapp-USGS)
W72-00818

THE USE OF CATIONIC RATIOS IN DETERMINING ANNUAL STRATIGRAPHIC LAYERS IN POLAR ICE,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
G. O. Linkletter.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968: International Association of Scientific Hydrology Publication 86, p 16-18, 1970. 2 fig.

Descriptors: *Ice, *Stratigraphy, *Glaciers, *Snowfall, *Water chemistry, Regimen, Water balance, Seasonal, Spectrophotometry, Cores, Sampling, Water analysis, Sodium, Potassium, Magnesium, Calcium, Density.
Identifiers: Polar ice caps.

Tests conducted on 89 cm of polar ice core include the measurement of cationic concentrations by atomic absorption spectrophotometry and a related microscopic investigation of the soluble particulate matter contained in the ice. Variations in the density of the ice were used to delineate annual layers, with which all other measurements were compared. The concentrations of Na, K, Mg, and Ca were

measured in melt water samples of the ice core. Na and K show slightly higher winter values whereas Ca and Mg have slightly higher summer values. No regular seasonal trend was found for any of the cationic concentrations. All four cations coincidently display three distinct peaks in concentration. These peaks account for approximately one-half of the total concentration of cations for the entire ice sample. The concentration peaks suggest periods of significant storm activity over the ice cap. Particle counts showed no apparent seasonal cycle in number or size distribution. (See also W72-00817) (Knapp-USGS)
W72-00819

SNOW ACCUMULATION ALONG THE SOUTH POLE-DRONNING MAUD LAND TRAVERSE,
Brussels Univ. (Belgium). Dept. of Nuclear Geology and Geochemistry.
E. Picciotto, W. De Brueck, and G. Crozaz.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 18-22, 1970. 1 fig, 4 tab, 7 ref.

Descriptors: *Snowpacks, *Antarctic, *Stratigraphy, *Sampling, *Geochemistry, Water balance, Firn, Glaciers, Regimen, Snowfall, Temperature, Radioisotopes, Stable isotopes, Water chemistry, Tracers, Glaciation.
Identifiers: *Antarctica.

Over 75 glaciological stations were established along the route of the South Pole-Dronning Maud Land Traverse. At each station, a 2-3 m pit was excavated for the purpose of stratigraphic studies and sampling for geochemical laboratory investigations. Accumulation values derived from pit studies in this region are generally too high. The central zone of the east Antarctic Plateau, situated within the 3,500 m contour line, and comprising the stations of Vostok, Pole of Inaccessibility, and Plateau Station, is characterized by a very low rate of snow accumulation, of the order of 3 g/sq cm/yr. An area with nearly zero accumulation is very evident. The very low accumulation is correlated with anomalously high firn temperature, intense firn metamorphism and relatively high 0-18/0-16 ratio. (See also W72-00817) (Knapp-USGS)
W72-00820

A SEARCH FOR COSMIC DUST IN A LARGE COLLECTION OF PARTICULATE AND DISSOLVED MATERIAL FROM POLAR ICE,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Geology.
R. H. McCorkell, W. H. Pinson, E. L. Fireman, and C. C. Langway, Jr.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 25-30, 1970. 5 tab, 24 ref.

Descriptors: *Trace elements, *Ice, *Arctic, *Provenance, Sampling, Water chemistry, Water analysis, Fallout, Snow.
Identifiers: *Cosmic dusts, *Greenland, *Camp Century.

Large collections of dissolved and particulate material from the ice at Camp Century, Greenland, were made and studied in the hope that evidence of cosmic dust would be found. Particulate and dissolved material could be collected from millions of liters of ice at Camp Century, because wells melted in the ice were used to supply the camp with water. Filters and ion exchange resin columns were inserted in the water lines. The Ni/Co ratio in the dissolved material is higher than in crustal material and resembles that in chondrite and carbonaceous chondrite meteorites. Mass spectrometric studies of inert gases extracted from the particulate material from the ice provide the only unequivocal evidence of an extraterrestrial component. Ni-63, Co-60 and Cl-36 are probably bomb fall-out. The ice from which the collections were made was 50-250 years old, but only a small addition of recent snow needs to be assumed to account for these isotopes. The Al-26 and Be-10 are clearly the result of production in the atmosphere by cosmic rays. (See also W72-00817) (Knapp-USGS)
W72-00821

HORIZONTAL AND VERTICAL DISTRIBUTION OF MICROPARTICLES IN THE 1965 LAYER BETWEEN BYRD STATION AND THE WHITMORE MOUNTAINS, ANTARCTICA,
Ohio State Univ., Columbus, Ohio. Inst. of Polar Studies.
W. L. Hamilton.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 31-42, 1970. 6 fig, 2 tab, 11 ref. NSF-GA-530.

Descriptors: *Snow, *Dusts, *Sedimentation, Particle size, Particle shape, Mineralogy, Stratigraphy, Fallout, Antarctic.
Identifiers: Byrd Station (Antarctica), Extraterrestrial dusts.

Studies of the microparticles from snow samples taken in the 1965 accumulation layer along a 358 km traverse from Mount Chapman to Byrd Station, Antarctica, show that the fallout and accretion of dust depend on climatological factors. The relative abundance of transparent spherules was positively correlated, and the relative abundance of opaque angular particles was negatively correlated, to the annual snow accumulation. The relative abundances of these two particle classes were negatively correlated to each other in vertical profiles in the 1965 layer, suggesting that fallout heterogeneity also depends on time variation of the precipitation rate. There was an abrupt increase in the abundance of microparticles believed to be hematite and goethite (or limonite) at sites nearest the mountains. The same sites also showed an abrupt increase in the volume concentration of particles smaller than 3-microns diameter. These increases are probably the result of local distribution of mountain-derived particles by winds. The abundance of particles larger than 3-microns diameter, relative to those larger than 0.6-microns diameter, decreased almost monotonically along the route in the direction of the mountains; eolian transport may be indicated. However, the effect of lower temperatures at higher elevations on the nucleation process may also account for this change in particle size. (See also W72-00817) (Knapp-USGS)
W72-00822

THE QUESTION OF THE ORIGIN OF THE MAGNETIC SPHERULES FOUND IN ANTARCTIC ICE,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
F. W. Wright, and P. W. Hodge.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N Y, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 42-47, 1970. 2 tab, 16 ref.

Descriptors: *Ice, *Antarctic, *Dusts, *Meteorites, *Sediments, Fallout, Mineralogy, Provenance, Glaciers, Particle size, Particle shape.
Identifiers: *Magnetic spherules, *Antarctica, *Extraterrestrial dusts.

Recent rocket and satellite measures indicate an influx of micrometeorites and meteoric dust that is several orders of magnitude smaller than the estimate given by earlier satellite detectors. For this reason, the vast majority of the polar-ice sediment particles previously identified as meteoric cannot now be considered either micrometeorites or ablation droplets from small meteoric bodies. The estimated influx of Fe-Ni particles only, as collected from ice at the South Pole, is consistent with the new satellite results. The remainder of the spherules, for which no plausible terrestrial origin has yet been found, may be ablation products from very large (several tons) bodies that may be cometary meteors or some type of carbonaceous chondrite. (See also W72-00817) (Knapp-USGS)
W72-00823

CHEMISTRY OF ANTARCTIC ICE: IMPLICATIONS ON THE RATE OF ACCRETION OF EXTRA-TERRESTRIAL MATTER,
Brussels Univ. (Belgium). Dept. of Nuclear Geology and Geochemistry.
F. Hanappe, M. Vosters, E. Picciotto, and S. Deutsch.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 47-50, 1970. 3 tab, 4 ref. Belgian F.R.F.C. (Proj 243). NSF Grant Ga-530.

Descriptors: *Ice, *Antarctic, *Dusts, *Provenance, *Meteorites, Sediments, Iron, Glaciers, Particle size.
Identifiers: *Antarctica, *Extraterrestrial dusts, Nickel.

To estimate the mass accretion of extraterrestrial material from the rate of deposition of nickel and other elements on the Antarctic ice-sheet, the abundance of Na, Mg, K, Ca, Mn, Fe and Ni was determined in firn samples collected at Base Roi Baudouin, Amundsen-Scott Station, and Plateau Station, Antarctica. From the nickel deposition found at Plateau Station and at Amundsen-Scott Station, an upper limit of 100,000 tons per year was derived for the total accretion of extraterrestrial material on the earth's surface. This figure is in agreement with estimates based on the osmium and iridium content of pelagic sediments, in spite of the large difference in the time intervals involved. (See also W72-00817) (Knapp-USGS)
W72-00824

DEEP CORE DRILLING AT BYRD STATION, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. T. Ueda, and D. E. Garfield.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 53-62, 1970. 6 fig.

Descriptors: *Core drilling, *Ice, *Antarctic, Glaciers, Heat flow, Sampling, Rotary drilling, Boreholes, Temperature, Drilling equipment.
Identifiers: *Byrd Station (Antarctica).

A deep core hole was drilled through the Antarctic ice sheet at Byrd Station during the 1967-68 austral summer. Drilling was accomplished with a cable-suspended electro-mechanical rotary drill. During the 1966-67 austral summer the equipment was installed and 220 m of ice was penetrated. Drilling was resumed in November 1967 and the hole was completed in January 1968. Cores 3 m to 6 m in length and averaging 10.8 cm in diameter were recovered throughout 99% of the depth drilled. The overall penetration rate averaged 20 m/day. Drill cuttings were dissolved in an aqueous ethylene glycol solution circulated at the bottom of the hole. The dilute solution was returned to the surface in the drill bailer on each coring run. Liquid water, indicative of pressure melting at the bottom of the ice sheet was encountered at 2,164 m depth. Attempts to recover a core of sub-ice material were not successful. Ice temperatures increased steadily from a minimum of -28.8 deg C at 800 m depth to -13.0 deg C at 1,800 m. No temperatures were measured below this depth. The heat flow for this location is estimated to be 1.8 micro cal/sq cm-sec. (See also W72-00817) (Knapp-USGS)
W72-00825

SELF-CONTAINED THERMAL PROBES FOR REMOTE MEASUREMENTS WITHIN AN ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. W. C. Aamot.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 63-68, 1970. 4 fig, 3 ref.

Descriptors: *Ice, *Glaciers, *Drilling, *Boreholes, *Instrumentation, Equipment, Antarctic, Arctic, Crystallization, Cryology, Stress, Temperature, Borehole geophysics, Telemetry, Remote control, Drilling equipment.
Identifiers: Thermal probes (Ice drilling).

Thermal probes are now available for penetrating polar ice sheets to depths as great as 3000 m for remote measurements of in situ temperature and stress conditions. Instrumentation payloads and systems are also being planned for studies of acoustic and electromagnetic transmission in ice, seismic observations, and ice movement. The vertical course of a probe is assured through positive attitude stabilization, either by mercury steering or pendulum steering. Power requirements for penetration and for lateral transfer to avoid premature hole closure depend on the probe speed and the ice temperature and can vary from 5 to 15 kw. The sealed confinement in the ice, the low temperatures, and the high pressures present special design problems. First results from a probe sent into the Greenland ice sheet at Camp Century and stopped at a depth of about 260 m gave a hyperbolic cooling curve approaching the final temperature to within 0.1 deg C after about six days and indicated a peak crystallization stress in the contined melt water during refreezing of about 88 bar above the overburden stress. Two probes reached 230 and 1000 m at Station Jarl Joset, providing valuable scientific and engineering information. (See also W72-00817) (Knapp-USGS)
W72-00826

A METHOD FOR SETTING A LOWER LIMIT ON THE WATER LAYER THICKNESS AT THE BOTTOM OF AN ICE SHEET FROM THE TIME REQUIRED FOR UPWELLING OF WATER INTO A BOREHOLE,
Cold Regions Research and Engineering Lab., Hanover, N.H.; and Northwestern Univ., Evanston, Ill. Dept. of Material Science and Geology.
J. Weertman.
In: International Symposium on Antarctic Glaciological Exploration (ISAGE), Hanover, N H, September 3-7, 1968; International Association of Scientific Hydrology Publication 86, p 69-73, 1970. 1 tab, 4 ref.

Descriptors: *Glaciers, *Boreholes, *Water level fluctuations, Confined water, Melt water, Pressure, Viscosity, Density, Transmissivity, Glaciation, Melting.
Identifiers: Subglacial water.

When a borehole penetrates an ice sheet whose bottom surface is at the melting point, upwelling of water into the borehole will occur if the drilling fluid has a pressure less than the overburden pressure. The time required for half of the upwelling to be completed can be used to obtain an estimate of the thickness of the water layer that exists between the bottom ice surface and an impervious bed if the ice sheet is elastically and plastically undeformable. The given equation sets a lower limit to the value of the thickness of the water layer beneath a deformable ice sheet. The actual thickness of the water layer under a deformable ice sheet can be one or more orders of magnitude larger than the value estimated from this equation. (See also W72-00817) (Knapp-USGS)
W72-00827

2D. Evaporation and Transpiration

EFFECT OF SOIL MOISTURE PRESSURE ON RELATIVE EVAPORATION (IN RUSSIAN),
I. I. Sudnitsyn, and V. D. Skalaban.
Meteorol Gidrol. 10. 84-89. 1968. English summary.
Identifiers: Consumption, Evaporation, Moisture, Oat-M, Plant, Pressure, Soil, Test, Transpiration.

Quantitative relationships between soil moisture pressure and various criteria of supply of available moisture are examined. A pot experiment with oat plants on heavy loamy chernozem soil showed that variation of the transpiration rate of the plants with changes in the pressure of soil moisture depended upon the entity of aerometeorological conditions and the properties of soil moisture determining its pressure. Potential transpiration was assumed to be 0.7 of evaporation and was calculated by Ivanov's formula. In assessing the available supply of moisture, measurements of soil moisture pressure were often sufficient and it was possible to make short-term predictions of moisture consumption by plants and of the available moisture supply.--Copyright 1971, Biological Abstracts, Inc.
W72-00669

NITROGEN UPTAKE OF PLANTS AFFECTED BY WINDBREAKS,
Department of Fisheries and Forestry, Winnipeg (Manitoba).
For primary bibliographic entry see Field 03F.
W72-00685

ALGORITHMS FOR COMPUTING THE WATER REGIME OF LANDSCAPES FOR A MATHEMATICAL MODEL OF MIGRATION PROCESSES (ALGORITMY ISCHISLENIYA VODNOGO REZHIMA LANDSHAFTOV SUSHI DLYA MATEMATICHESKOY MODELI MIGRATSIONNYKH PROTSESSOV),
V. L. Anokhin.
Pochvovedeniye, No 1, p 92-102, January 1971. 2 fig, 4 tab, 24 ref.

Descriptors: *Soil physics, *Hydrologic cycle, *Energy budget, *Water balance, *Transpiration, Evaporation, Precipitation (Atmospheric), Leaching, Vegetation, Biomass, Forests, Grasslands, Mathematical studies, Mathematical models, Computers.
Identifiers: *USSR, *Algorithms, *Water regime, *Landscapes, Biogeocenoses, Biogeochemistry, Structural algebra, Balance computations.

Algorithms of balance computations of the water regime of landscapes were based on two contrasting types of biogeocenoses borrowed from the literature--a forest landscape in the Sod-Podzolic zone with a leaching water regime and a Chernozem steppe landscape with a periodically leaching water regime. Methods of constructing algorithms from graphic relationships between water-regime components were examined together with the matrix method of representing graphic relationships and algorithms, considered to be the most suitable for conventional computations and for computer programming. Based on the results of tentative computations of water distribution in the two types of landscapes examined, it is concluded that the transpiration rates for the forest and steppe vegetation are nearly the same despite their significantly different biomasses. (Josefson-USGS)
W72-00807

LYSIMETERS WITH RAINFALL AND SOIL WATER CONTROL,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
K. J. Kristensen, and H. C. Aslyng.
Nordic Hydrology, Vol 2, No 2, p79-92, 1971. 12 fig, 1 tab, 7 ref.

Descriptors: *Lysimeters, *Soil water, *Evapotranspiration, *Consumptive use, Instrumentation, Moisture content, Simulated rainfall, Automation, Nuclear mositure meters.

A lysimeter installation of 36 concrete tanks each with a soil surface of 4 sq m is useful for plant growth experiments involving different treatments combined with various controlled water supplies. The ground installation is at least 20 cm below the soil surface so that tillage can be done with ordinary field implements. The lysimeter tanks are provided with a drainage system which can drain the soil at the bottom (100 cm depth) to a tension of up to 100 cm. A constant groundwater table at less than 100 cm soil depth can also be maintained. The soil moisture content at different depths is determined from an underground tunnel by use of gamma radiation equipment in metal tubes horizontally installed in the soil. Rainfall is controlled by a movable glass roof automatically operated and controlled by a special rain sensor. Water is applied to the soil surface with a special trickle irrigation system consisting of a set of plastic tubes for each lysimeter tank and controlled from the tunnel. Fertilizers can be applied with the irrigation water. (Knapp-USGS)
W72-00834

AN EVALUATION OF TWO METHODS FOR OBTAINING LEAF TRANSMISSIVITY FROM LEAF REFLECTIVITY MEASUREMENTS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Climatology and Meteorology.
R. E. Carlson, and D. N. Yarger.
Agronomy Journal, Vol 63, p 78-81, Jan-Feb 1971. 5 fig, 1 tab, 6 equations, 8 ref.

Descriptors: *Evaluation, *Measurement, *Leaves, *Optical properties, *Transmissivity, Equations, Corn (Field), Soybeans, Remote sensing, Pigments, Spectroscopy, Moisture content.

This paper evaluates a quadratic and a cubic method for calculating leaf transmissivity from leaf reflectivity measurements. Dissimilar leaves of corn and soybean were tested. Leaf reflectivity is an optical property, important in remote sensing, and dependent on leaf structure, pigmentation, and water content. Reflectivity and transmissivity measurements were made on 5 samples of each plant. Calculated values were compared with measured transmissivities; nearly identical results were obtained for the spectral range 500 to 2,600 millimicrons. Leaf transmissivity can be calculated within a relative error of 5 percent of measured values. (Popkin-Arizona)
W72-00882

FIELD STUDY OF EVAPORATION: NOTES ON THE EXTRACTION AND COMPUTATION OF DATA.
Snowy Mountains Engineering Corp.

Australian Water Resources Council Technical Paper No. 2, March 1971. 55 p, 21 forms, 7 ref.

Descriptors: *Evaporation, *Lakes, *Heat budget, *Equations, Wind velocity, Vapor pressure, Radiation, Advection, Latent heat, Specific heat, Temperature, Separation techniques, Thermal capacity.
Identifiers: *Australia, *Bowen Ratio.

Extraction and computation of evaporation data for 3 Australian lakes (Mundaring, Manton, Cataract) is based on bulk aerodynamic and heat-budget methods. The format for output requirements is presented with sample calculations. Details on data extraction and computation for quantities being measured at meteorological land stations are included. (Popkin-Arizona)
W72-00888

2E. Streamflow and Runoff

OSCILLATORY KERNEL FUNCTIONS IN LINEAR HYDROLOGIC MODELS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00584

HYDRODYNAMICAL STUDIES ON THE ST. LAWRENCE RIVER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
G. Godin.
Report Series No 18, 1971. 116 p, 30 fig, 8 tab, 10 ref.

Descriptors: *St. Lawrence River, *Streamflow, *Tides, *Hydrologic data, *Model studies, Mathematical models, Hydrology, Flow characteristics, Flow rates, Equations, Stream gages, Discharge measurement, Tidal waters.
Identifiers: *Streamflow characteristics.

Fundamental concepts of hydrodynamics were used to study the steady and tidal flows in the St. Lawrence River. A one dimensional numerical model of the St. Lawrence River is evaluated. The model reproduces adequately the main features of the major tidal constituents; it reproduces qualitatively but not quantitatively, the shallow water constituents. It indicates that the fluctuations in the discharge are felt only upstream of the Quebec constriction. The amplitude of the tide is little affected but its progress may be retarded by up to 3 hours. The slow shallow water constituents are increased when the discharge is increased; but in the range of the value of the friction considered, the amplitude of the fast and slow shallow water constituents is decreased when friction is increased. The model indicates that blockage anywhere in the river automatically involves an increase in tidal velocity downstream. (Woodard-USGS)
W72-00590

EFFECT OF INLET GEOMETRY ON FLOW-ANGLE CHARACTERISTICS OF MINIATURE TOTAL-PRESSURE TUBES,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 08B.
W72-00596

PARAMETER MEASUREMENT IN FLUVIAL MORPHOLOGY,
Purdue Univ., Lafayette, Ind.
D. M. Coffman.
Indiana Academy of Science for 1969 Proceedings, Vol 79, p 333-343, 1970. 5 fig, 2 tab, 9 ref. OWRR A-007-IND (2).

Descriptors: *Maps, *Channel morphology, *Streams, *Drainage patterns (Geologic), *Topography, Contours, Elevation, Alluvial channels, Streamflow, Geology, Hydrologic data, Evaluation.
Identifiers: *Topographic maps, *Fluvial morphology, Parameter measurement.

Problems are pointed out concerning accurately ordered drainage maps from commonly available topographic maps scaled 1:62,500 and 1:24,000 for research in fluvial morphology. It is indicated that blue lines of such maps represent third and fourth order streams. Interpretation of topographic maps by Strahler's method of 'V's' does not necessarily result in an accurate drainage map. Relief, age, and geology appear to control the quality of drainage maps which are produced. The relative relief of apparent first-order streams may be used to predict the quality of a drainage map which will be produced from a topographic quadrangle and permits classifications of these quadrangles as excellent, marginal, and unacceptable. (Woodard-USGS).
W72-00604

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 3. OHIO RIVER BASIN BELOW WABASH RIVER.
Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C., 20402 - Price $3.50. Geological Survey Water-Supply Paper 1910, 1971. 738 p, 1 fig, 1 plate.

Descriptors: *Data collections, *Surface waters, *Streamflow, *Water quality, *Ohio River, Stream gages, Lakes, Reservoirs, Stage-discharge relations, Sediment discharge, Water temperature, Low flow, Peak discharge, Tennessee River.
Identifiers: Surface water records, Ohio Basin below Wabash.

One of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1961-65 water years, this report covers the Ohio River basin below the Wabash River. The data generally comprise a station description and a table showing daily discharge and monthly and yearly discharges. Station descriptions give the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. Type of gage currently in use and datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the record period are listed. Conditions affecting natural flow and information on accuracy of records are noted. Tables give daily, average, and extreme discharges and yearly totals and peak discharges. Chemical quality, fluvial sediment, and water temperatures are listed for the data collection sites. Chemical quality includes concentrations of individual dissolved constituents, hardness, specific conductance, and pH. Fluvial-sediment information is given for suspended-sediment discharges and concentrations. Data for water temperature are once-daily observations except for sites where continuous temperature recorders furnish information from which minimums and maximums are obtained. (Lang-USGS)
W72-00610

HYDROBIOLOGICAL STUDY OF THE MEURTHE RIVER (VOSGES),
Jean-Francois Pierre.
Bull Soc Bot Fr. 117 (3/4): 89-96. 1970. English summary.
Identifiers: Algal, France, Hydrobiological, Meurthe, Populations, River, Vosges.

A hydrobiological study was made of a right-side tributary of the river Meurthe. Relations between geological, physical and chemical characteristics and distribution of algal populations are discussed.--Copyright 1971, Biological Abstracts, Inc.
W72-00705

WATER RESOURCES OF SALT LAKE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-00788

WATER USE IN SOUTH CAROLINA-1970.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 06D.
W72-00791

WATER RESOURCES DATA FOR LOUISIANA: PART 1, SURFACE WATER RECORDS: PART 2, WATER QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 07C.
W72-00794

WATER BALANCE OF THE GREATER CAUCASUS (VODNYY BALANS BOL'SHOGO KAVKAZA),
For primary bibliographic entry see Field 02A.
W72-00812

A METHOD FOR SETTING A LOWER LIMIT ON THE WATER LAYER THICKNESS AT THE BOTTOM OF AN ICE SHEET FROM THE TIME REQUIRED FOR UPWELLING OF WATER INTO A BOREHOLE,
Cold Regions Research and Engineering Lab., Hanover, N.H.; and Northwestern Univ., Evanston, Ill. Dept. of Material Science and Geology.
For primary bibliographic entry see Field 02C.
W72-00827

2F. Groundwater

DARCY'S LAW AT SMALL POTENTIAL GRADIENTS,
Cambridge Univ. (England).
For primary bibliographic entry see Field 02G.
W72-00581

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1971,
Geological Survey, Salt Lake City, Utah.
R. M. Cordova.
Utah Division of Water Resources Cooperative Investigations Report No 9, 1971. 72 p, 37 fig, 2 tab, 8 ref.

Descriptors: *Groundwater, *Water resources development, *Water wells, *Water supply, *Utah, Water yield, Water level fluctuations, Water utilization, Consumptive use, Hydrologic data, Data collections.
Identifiers: *Groundwater development (Utah).

The larger groundwater basins and those containing most of the groundwater developments in Utah are shown with information about the number of wells constructed and the withdrawal of water from wells during 1970. The discussions summarize groundwater development and changes in groundwater conditions in the major areas of groundwater development. The estimated total withdrawal of water from wells in Utah in 1970 was 680,000 acre-feet, or about 10,000 acre-feet more than for 1969. Withdrawal for irrigation increased by 6,000 acre-feet, for industry decreased by 13,600 acre-feet, for public supply increased 16,100 acre-feet, and for domestic and stock increased by 400 acre-feet. Precipitation in four of the seven divisions in Utah was below normal, but it was 0.16 inch above normal in the south-central division and 3.96 inches above normal in the north-central division: these two divisions include most of the major areas of groundwater development of the State. (Woodard-USGS)
W72-00586

RESULTS OF AQUIFER TESTS IN MISSISSIPPI.
Geological Survey, Jackson, Miss. Water Resources Div.

Mississippi Board of Water Commissioners Bulletin 71-2, 1971. 44 p.

Descriptors: *Aquifer characteristics, *Mississippi, *Geohydrologic units, *Testing, Hydraulic conductivity, Storage coefficients, Specific capacity, Permeability, Transmissivity, Theis equation, On-site data collections, Data processing, Gulf Coastal Plain, Water supply.
Identifiers: *Aquifer testing, *Computerized data, Water-supply potential.

Data for about 400 aquifer tests are presented to provide an overall view of the magnitude and variety of the quantitative potential of Mississippi's groundwater resources and to give specific information on an aquifer or a site contemplated for water-supply development. The tests date from 1942. Beginning in 1963 an average 40-50 tests per year were made. Of the 82 counties in the state, 66 are represented in this report. In two-thirds of the

tests only a pumping well was used; the remainder had a pumping well and one or more observation wells. The tests were made using well discharges of less than 10 to nearly 6,000 gallons per minute. Aquifer transmissibility values obtained range from less than 1,000 to 600,000 gallons per day per foot. Methods of analysis are described, definition of terms given, and a geologic unit code with alphabetical list of the aquifers is outlined. A computer printout of pumping test data is tabulated by counties. (Land-USGS)
W72-00587

URANIUM AND TRITIUM AS NATURAL TRACERS IN THE FLORIDAN AQUIFER,
Florida State Univ., Tallahassee. Dept. of Geology.
J. K. Osmond, B. F. Buie, H. S. Rydell, M. I. Kaufman, and E. I. Wallick.
Florida State University Water Resources Research Center Technical Completion Report, August 1971. 90 p, 12 fig, 8 tab, 39 ref, 3 append. OWRR Project A-011-Fla (7).

Descriptors: *Groundwater movement, *Tracers, *Radioisotopes, *Tritium, *Uranium radioisotopes, Florida, Aquifers, Springs, Aquifer characteristics, Analytical techniques, Hydrologic data, Hydrogeology.
Identifiers: *Naturally occurring radioisotopes, *Florida aquifer.

Naturally occurring radioisotopes serve as hydrologic tracers in the study of groundwater movement and aquifer recharge. A benzene synthesis method of tritium analysis involving no isotopic enrichment was developed which permits analysis of samples at a level of 10 or more tritium units. In the North Florida study area sharp boundaries separate young and old waters in the aquifer according to their tritium content. Uranium in groundwater exhibits extreme variability in isotopic distribution and the combination of isotopic ratio (U-234/U-238) and total uranium concentration serves as the tag with which to trace aquifer water. The sources of water flowing from Wakulla Springs and Silver Springs was calculated quantitatively; the results agree well with conclusions based on standard hydrologic methods of analysis. Uranium analysis requires one to four gallons of water per sample, and involves isotopic spiking with U-232, iron hydroxide co-precipitation, ion exchange separation, electrodeposition, vacuum counting, and alpha pulse height analysis. (Woodard-USGS)
W72-00588

GROUND-WATER CONDITIONS DURING 1969-VANDENBERG AIR FORCE BASE AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W72-00593

TIDES IN CONFINED WELL-AQUIFER SYSTEMS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geological Sciences.
For primary bibliographic entry see Field 04B.
W72-00598

GROUND-WATER RESOURCES OF AVOYELLES PARISH, LOUISIANA,
Geological Survey, Baton Rouge, La.
James R. Marie.
Louisiana Geological Survey and Department of Public Works Water Resources Bulletin No 15, February 1971. 70 p, 13 fig, 4 plate, 6 tab, 34 ref.

Descriptors: *Groundwater, *Water resources development, *Louisiana, *Water wells, Aquifer characteristics, Water yield, Water quality, Water users, Surveys, Hydrologic data, Chemical analysis, Pumping, Water level fluctuations, Groundwater movement, Withdrawal.

Avoyelles Parish, an area of approximately 840 square miles, is in east-central Louisiana. The parish lies almost entirely within the Mississippi alluvial valley where the Red River and the Mississippi River valleys coalesce. Two geologic units--the Quaternary and upper Tertiary--form two distinct aquifer systems. The Quaternary aquifer system has an average coefficient of permeability and transmissibility of 2,000 gpd per square foot and 200,000 gpd per foot, respectively. The upper Tertiary aquifer system has an average coefficient of permeability and transmissibility of 250 gpd per square foot and 10,000 gpd per foot, respectively, in the western part of the parish and an average of 800 gpd per square foot and 65,000 gpd per foot, respectively, in the eastern part of the parish. The Quaternary aquifer system offers the greatest potential source of groundwater. However, because of hardness and high iron, the water must be treated for uses other than irrigation and industrial cooling. The water in the southeastern area is well suited for public and industrial supplies. (Woodard-USGS).
W72-00599

CHEMICAL QUALITY OF GROUND WATER IN THE DOS PALOS-KETTLEMAN CITY AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. L. Bertoldi.
Geological Survey Open-file Report, March 11, 1971. 45 p, 11 fig, 12 tab, 18 ref.

Descriptors: *Groundwater, *Water quality, *Chemical analysis, *Data collections, *California, Water wells, Aquifers, Irrigation, Water analysis.
Identifiers: *San Joaquin Valley (Calif).

Chemical quality data of groundwater are presented for the Dos Palos-Kettleman City area (approximately 1,350 square miles on the central-western side of the San Joaquin Valley, California). Large-scale farming operations in the area have used groundwater as the major source of irrigation water for nearly three-quarters of a century. In 1968, completion of the San Luis Canal part of the California Aqueduct, made surface water available to farmers. In time the widespread use of this imported water may cause chemical-quality changes in the native groundwater. To document conditions prior to any possible changes, 361 samples of groundwater were taken before deliveries of surface water were begun. The data will serve as a base to which future investigations can be compared. Most of the groundwater has a high salinity hazard with medium to high sodium concentrations and can be used only on salt-tolerant crops. The most important of the individual elements considered is boron. Upper zone water may be used on most boron-tolerant crops, but lower zone water cannot be used for irrigation of deciduous fruit or citrus. (Woodard-USGS)
W72-00600

APPLICATIONS AND INTERPRETATIONS OF RESULTS, SECTION III OF NUCLEAR WELL LOGGING IN HYDROLOGY,
W. S. Keys, and V. I. Ferronsky.
International Atomic Energy Agency Technical Report Series No 126, p 51-82, April 1971. 13 fig, 3 tab, 34 ref.

Descriptors: *Wells, *Logging (Recording), *Aquifer characteristics, *Nuclear meters, Gamma rays, Analytical techniques, Instrumentation, Electromagnetic waves, Radiation, Hydrologic data, Data collections.

The most widespread use of nuclear logs in hydrology is for the identification of the lithology of aquifers and associated rocks and for stratigraphic correlation. The three kinds of radiation logs: natural gamma; gamma-gamma, and neutron illustrate the advantages of considering the interrelationships of different types of logs. A simplified diagram of radiation-log response in saturated clastic sediments is presented. For illustration purposes these sediments are considered to be a mixture of water, quartz sand, and clay in various proportions which may change the porosity and permeability of the hypothetical aquifer as described on the outside of the triangle. The following generalities can then be made about radiation-log response shown on the inside of the triangle: 1. the natural gamma intensity or count rate increases with increasing clay content. 2. The neutron count rate will increase with decreasing porosity (for probes with long spacing). 3. The gamma-gamma count rate increases with increasing porosity. (Woodard-USGS)
W72-00602

GROUND-WATER HYDROLOGY OF THE SAN PITCH RIVER DRAINAGE BASIN, SANPETE COUNTY, UTAH,
Geological Survey, Washington, D. C.
G. B. Robinson, Jr.
Available from GPO, Washington, D.C. 20402 - Price $2.50. Geological Survey Water-Supply Paper 1896, 1971. 80 p, 14 fig, 4 plate, 12 tab, 47 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Utah, Water yeild, Water quality, Watersheds (Basins), Withdrawal, Groundwater recharge, Water users, Chemical analysis, Groundwater basins, Water level fluctuations, Springs, Aquifers, Aquifer characteristics, Surface-groundwater relationships, Precipitation (Atmospheric), Runoff, Data collections, Groundwater movement.
Identifiers: *Groundwater hydrology, *Sanpete County (Utah).

The groundwater hydrology investigation of the San Pitch River drainage basin in central Utah was concerned primarily with the Sanpete and Arapien Valleys, which comprise about 150 square miles of the 850 square mile basin. Sanpete Valley is about 40 miles long and has a maximum width of 13 miles, and Arapien Valley is about 8 miles long and 1 mile wide. The valleys are bordered by muontains and plateaus that range in altitude from 5,200 to 11,000 feet above mean sea level. The average annual precipitation on the valleys is about 12 inches, but precipitation on the surrounding mountains reaches a maximum of about 40 inches per year. Most of the precipitation on the mountains falls as snow, and runoff from snowmelt during the spring and summer is conveyed to the valleys by numerous tributaries of the San Pitch River. Seepage from the tributary channels and underflow beneath the channels are the major sources of recharge to the groundwater reservoir in the valleys. Unconsolidated valley fill constitutes the main groundwater reservoir. In 1965, a year of above-normal precipitation, the discharge from wells was 12,000 acre-feet, whereas in 1966, a year of below-normal precipitation, the wells discharged 21,000 acre-feet. The groundwater in most parts of the valleys is fresh and suitable for public supply and irrigation. (Woodard-USGS)
W72-00603

PRELIMINARY DIGITAL MODEL STUDIES OF THE RIO ACONCAGUA VALLEY, CHILE,
Geological Survey, Denver, Colo.
O. J. Taylor.
Geological Survey Open-file Report, October 1970. 37 p, 8 fig, 3 tab, 11 ref. append.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Model studies, Hydrogeology, Digital computers, Analytical techniques, Aquifer characteristics, Water yield, Water users, Irrigation, Streamflow, Groundwater movement, Groundwater recharge.
Identifiers: *Rio Aconcagua Valley (Chile).

The Rio Aconcagua valley in central Chile is filled with alluvial deposits as thick as 600 meters. The irrigated part, which is the main agricultural area, extends from Chacabuquito to the Pacific Ocean, a distance of 113 kilometers. The saturated sand and gravel forms an unconfined aquifer, and is hydrau-

lically connected to the Rio Aconcagua in three of the four sections established to administer the water of the valley. The Hijuelas reach of the valley is about 7 kilometers long and is located in the third administrative section. Preliminary tests of the hydraulic properties of the Hijuelas reach of the valley were made using digital models. The stream-aquifer relation was summarized and the effects of various irrigation practices and losses on streamflow and groundwater storage were simulated. Withdrawals from wells reduced groundwater storage. Return flows to the stream peaked at, or shortly after, the end of the period of irrigation in all three simulations. Less return flow occurred following simulated use of surface and groundwater. (See also W72-00609) (Woodard-USGS)
W72-00606

GRAVEL AND SAND AQUIFER IN THE BASSANO-GEN REGION, ALBERTA,
Research Council of Alberta, Edmonton.
V. A. Carlson, W. R. Turner, and K. W. Geiger.
Research Council of Alberta Report 69-4, 1969. 25 p, 10 fig, 2 tab, 21 ref, 2 append.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Water quality, Water resources development, Water yield, Water supply, Glacial drift, Groundwater, Aquifers, Sands, Gravels.
Identifiers: *Aquifer tests, *Alberta (Canada).

Underlying the Bassano-Gen region of Alberta, Canada, is a northeast-trending preglacial river valley whose extensive northern flank is covered by sand and gravel. The floor of the valley is also covered but the abbreviated southern bank is not. The gravel and sand appear to be extensive and continuous and, where saturated, to constitute a potential aquifer of some importance. Estimated safe yields for wells finished in this gravel and sand range from less than 10 to approvimately 80 imperial gallons per minute on a 20-year basis. The water appears to be chemically suitable judging from the few chemical analyses available. (Knapp-USGS)
W72-00608

WATER RESOURCES INVESTIGATION PROGRAM FOR RIO ACONCAGUA VALLEY, CHILE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02A.
W72-00609

GROUND WATER BASIC DATA--MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N.Dak.
R. L. Klausing.
North Dakota Geological Survey Bulletin 60, Part II--North Dakota Water Commission County Ground Water Studies 19, Part II, 1971. 468 p, 2 fig, 1 plate, 4 tab, 17 ref.

Descriptors: *Data collections, *Water wells, *Hydrogeology, *North Dakota, Hydrologic properties, Water levels, Water chemistry, Logging (Recording), Geohydrologic units, Aquifer characteristics, Springs, Water users, Planning, Groundwater movement. 25McLean County (N Dak).

To determine the quantity and quality of groundwater available in McLean County, North Dakota for municipal, domestic, livestock, industrial, and irrigation uses, the information in this report was collected between 1966 and 1970 and is presented in tables and graphs. Data are given for 1,750 wells and test holes and for 12 springs; water-level measurements are tabulated for 196 observation wells; lithologic logs, and electric logs where available, are given for 729 test holes and selected wells; and chemical analyses of 329 water samples are given. A map, scale 2 miles per inch, shows the location of wells, test holes, and springs. The information presented is useful for predicting geologic and groundwater conditions in McLean County so that a person considering the construction of a new well can locate the proposed site on the map, determine the characteristics of nearby wells, and the changes in water level, type of material encountered, and chemical quality of water can be determined generally from the other tables. (Lang-USGS)
W72-00611

WATER RESOURCES OF SALT LAKE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-00788

RECONNAISSANCE OF SEA-WATER INTRUSION ALONG COASTAL WASHINGTON, 1966--68,
Geological Survey Tacoma, Wash. Water Resources Div.
K. L. Walters.
Dept. of Ecology, Olympia, Wash, 98504--Price $2.50. Washington Department of Ecology Water-Supply Bulletin No 32, 1971. 208 p, 4 fig, 8 plate, 8 tab, 8 ref.

Descriptors: *Water resources development, *Groundwater, *Water demand, *Hydrologic data, *Washington, Water wells, Saline water intrusion, Aquifers, Aquifer characteristics, Water yeild, Withdrawal, Groundwater recharge, Water quality, Chemical analysis, Salinity, Coasts, Pacific Ocean, Data collections, Water users.
Identifiers: *Washington coast.

Rapidly developing area of the State of Washington are placing large demands on some coastal area groundwater supplies that were totally undeveloped a few years ago. The present occurrence and general extent of salt-water intrusion into the groundwater reservoirs were determined and areas of possible future sea-water intrusion delineated. Collection of data was generally limited to areas within 1 mile of the shoreline, and the chloride content of groundwater was used as the principal criterion for the recognition of sea-water intrusion. Uncontaminated groundwater in most coastal areas of Washington contains less than 10 mg/liter of chloride. Most wells tapping aquifers intruded by sea water yield water having chloride concentrations of less than about 750 mg/liter but a few have concentrations of more than 5,000 mg/liter. Although it has not reached serious proportions sea-water intrusion has occurred near Olympia, at Tacoma, in Northern Kitsap and northeastern Jefferson Counties, and in Island County. Small areas of additional intrusion are expected to develop with increased local pumping, and some intrusion may become more pronounced where it is now only incipient. (Woodard-USGS)
W72-00789

WATER USE IN SOUTH CAROLINA-1970.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 06D.
W72-00791

LOGS OF WELLS IN CAMPBELL COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 07C.
W72-00795

GROUNDWATER SEEPAGE PAST SHARP AND ROUNDED CORNERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-00802

RESIDUAL SALINIZATION OF VIRGIN SOILS AND GROUNDWATER IN THE SOUTHWESTERN PART OF THE GOLODNAYA STEEPE (OSTATOCHNOYE ZASOLENIYE TSELINNYKH POCHV I GRUNTOVYKH VOD YUGO-ZAPADNOY CHASTI GOLODNOY STEPI),
Central Asian State Inst. for the Design and Planning of Irrigation Structures and Rural Electric Powerplants, Tashkent (USSR).
For primary bibliographic entry see Field 03C.
W72-00806

REGULATING THE GROUNDWATER REGIME OF EXCESSIVELY WET LANDS (REZHIM GRUNTOVYKH VOD PEREUVLAZHNENNYKH ZEMEL' I YEGO REGULIROVANIYE),
For primary bibliographic entry see Field 02G.
W72-00815

INTERTEMPORAL ALLOCATION OF GROUND WATER IN THE CENTRAL OGALLALA FORMATION: AN APPLICATION OF A MULTISTAGE SEQUENTIAL DECISION MODEL,
Haile Sellassie I Univ., Alem Maya (Ethopia). Dept. of Economics; and Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
S. E. Bekure, and V. R. Eidman.
Oklahoma State University, Agricultural Experiment Station, Journal 2180, 1971. 13 p, 1 tab, 9 ref. OWRR Project B-010-OKLA (3).

Descriptors: *Water allocation (Policy), *Groundwater mining, *Economic justification, *Water utilization, *Water management (Applied), Aquifers, Groundwater recharge, Decision making, Mathematical models, Model studies, Computer programs, Linear programming, Markov processes, Input-output analysis, Discount rate, Constraints, Limiting factors, Political aspects, Capital costs, Labor, Resource allocation, Oklahoma, Water properties.
Identifiers: *Ogallala Formation.

Economic and common property arguments are presented for allocation of groundwater where recharge is insignificant relative to withdrawal as in the Ogallala Formation of the Oklahoma panhandle and surrounding areas. This paper formulates the optimal intertemporal allocation of groundwater as a decision model to test whether projected rates of withdrawals represent a potential misallocation of the water resources. The study area includes 17,500 sq. mi. region, underlain by 369 million acre feet of water. The aquifer supplies practically all irrigation, industrial, and municipal wate to the area. A recursive linear programming model projects the rate of groundwater use in the future. Assumptions are discussed. The decision model applies Markovian dependence to the individual stages. Inputs, empirical results, and policy implications are outlined. High discount rate, constraints on crops by market or governmental policy, and capital and labor limitations may constrain operators so that groundwater mining does not result in automatic intertemporal misallocation. Groundwater misallocation is not a direct corollary of its being a common property stock resource. (Popkin-Arizona)
W72-00889

THE RELATION OF URANIUM OCCURRENCES TO GROUNDWATER FLOW SYSTEMS,
North Dakota Univ., Grand Forks. Dept. of Geology.
J. L. Hagmaier.
Earth Sciences Bulletin, Vol 4, No 2, p 19-24, June 1971. 4 fig, 30 ref.

Descriptors: *Groundwater movement, *Chemical properties, *Uranium radioisotopes, *Carbonates, Bicarbonates, Chlorides, Sulfates, Wyoming, Geologic mapping, Geologic formations, Subsurface flow, Flow characteristics.
Identifiers: *Hydrochemical facies.

This paper reviews the theory of regional groundwater flow systems and their hydrochemistry, and

suggests a possible relationship between groundwater flow systems and the transportation and emplacement of Uranium in the intermontane basins of the Rocky Mountain region. Essentially, groundwater flow systems develop, in order, bicarbonate, sulfate and chloride hydrochemical facies, from recharge to discharge areas. In a reasonably heterogeneous sediment these facies will be determined by the different solubilities of the common salts and not by the mineralogical composition of the host rocks. Uranium may be transported by either acidic or neutral carbonate solutions, but the latter is most likely in modern geologic environments. The carbonate-uranium complex would be precipitated in the transition zone between the carbonate and sulfate facies. Since the bicarbonate facies is generally associated with regional groundwater recharge areas, it follows that the most likely locations for uranium exploration is in these areas. This conclusion is supported by a review of the groundwater and uranium geology of the Powder River Basin, Wyoming. A model reconstruction of the area at the time of uranium deposition is presented. (Casey-Arizona)
W72-00893

PROJECT AQUARIUS--GEOHYDROLOGIC INVESTIGATION,
Arizona Univ., Tuscon.
For primary bibliographic entry see Field 08H.
W72-00971

2G. Water in Soils

A PHOSPHATE SORPTION INDEX FOR SOILS,
Macaulay Inst. for Soil Research, Aberdeen (Scotland). Dept. of Soil Fertility.
B. W. Bache, and E. G. Williams.
Journal of Soil Science, Vol 22, No 3, p 289-301, September 1971. 3 fig, 3 tab, 18 ref.

Descriptors: *Sorption, *Phosphates, *Soil chemistry, Soil chemical properties, Correlation analysis, Soil properties, Hydrogen ion concentration, Inorganic compounds.

Phosphate sorption isotherms covering a wide concentration range (1 millionth to 0.005 M phosphate) were determined for 42 soil samples at 20 deg C. The slope of a plot of the sorption, x, against the logarithm of the equilibrium solution phosphate concentration, log c, proved a suitable reference index to characterized the phosphate sorbing properties of the soils. Several single-point methods were tested by statistical correlation against this reference index. Of these, the sorption, x, from one addition of 150 mg P/100 g soil gave r&0.951, but r—0.974 when the equilibrium concentration was also taken into account in the quotient x/log c. This quotient is therefore suggested as a simple yet adequate way of indicating a fundamental soil property, the phosphate sorption isotherm. (Knapp-USGS)
W72-00579

AIR AND WATER PERMEABILITY OF COMPACTED UNSATURATED COHESIVE SOIL,
Manchester Univ. (England).
L. Barden, and G. Pavlakis.
Journal of Soil Science, Vol 22, No 3, p 302-318, September 1971. 10 fig, 1 tab, 21 ref.

Descriptors: *Soil water movement, *Permeability, *Soil physical properties, *Compacted soils, Permeameters, Unsaturated flow, Soil structure, Infiltration, Soil compaction, Soil texture, Soil density.

The air and water permeabilities of unsaturated cohesive soils were measured in a modified triaxial cell permeameter which maintains separate continuity of both the air and water phases during permeation. Three different cohesive soils were tested, and the results were interpreted in terms of the cluster concept of soil structure, which recognizes the existence of both macro- and micro-pores. Both air and water permeability are dominated by the geometry and degree of saturation of the intercluster macro-pores. Compression of the soil always reduces the air permeability but can increase the water permeability by increasing the membrane flow around the clusters. The relations between soil suction, occlusion of the air channels, and compaction water content were also studied. (Knapp-USGS)
W72-00580

DARCY'S LAW AT SMALL POTENTIAL GRADIENTS,
Cambridge Univ. (England).
E. C. Childs, and E. Tzimas.
Journal of Soil Science, Vol 22, No 3, p 319-327, September 1971. 3 fig, 2 tab, 10 ref.

Descriptors: *Darcys law, *Soil water movement, *Groundwater movement, Hydraulic conductivity, Porosity, Permeability, Hydraulic gradient, Non-Newtonian flow, Rheology.

In recent years doubt has been cast upon the validity of Darcy's law when the gradient of hydraulic potential is small. It has been supposed that in clay materials the anomalous reduction of hydraulic conductivity, where it has been observed, is due to interaction between the water and the surface-active clay minerals. Bingham type plastic flow of water has been reported to occur in a quartz capillary tube at small potential gradients, with a shear strength of about 0.05 dyne per sq cm. If confirmed, this would greatly affect the theory of groundwater drainage. Experiments using a granular porous material of glass spheres with pore sizes of the same order as the reported capillary radius, indicated conformity to Darcy's law and to Newtonian flow down to one-tenth of the threshold gradient reported by the Russian workers. Semiquantitative evidence confirms Darcy's law through zero potential gradient. (Knapp-USGS)
W72-00581

THERMODYNAMICS OF SINGLY CHARGED ION EXCHANGES IN THE TRACE REGIONS ON CAMP BERTEAU MONTMORILLONITE,
Louvain Univ. (Belgium) Inst. of Agronomy.
J. Robeyns, R. Van Bladel, and H. Laudelout.
Journal of Soil Science, Vol 22, No 3, p 336-341, September 1971. 3 fig, 5 ref.

Descriptors: *Ion exchange, *Montmorillonite, *Clay minerals, *Trace elements, Equilibrium, Aqueous solutions, Free energy, Chlorides, Clays, Cation exchange.
Identifiers: *Henrys law.

Ion exchange equilibria for seven pairs of singly charged ions between aqueous chloride solutions and a montmorillonite clay were studied at 25 deg C at low values of total normality. Only the trace region for the preferred ion was investigated. The analog of Henry's law was found to be valid. The exchanges were almost ideal and standard free energies were calculated from experimental data by extrapolating to half-loading with one of the ions. The results satisfy the requirement of additivity and are in good agreement with known values. (Knapp-USGS)
W72-00582

PROLONGED LEACHING OF ORTHIC BLACK AH MATERIAL WITH WATER AND AQUEOUS EXTRACTS OF POPULUS TREMULOIDES AND P. BALSAMIFERA LEAVES,
Department of Agriculture, Lethbridge, (Alberta). Research Station.
J. F. Dormaar.
Journal of Soil Science, Vol 22, No 3, p 350-358, September 1971. 2 fig, 2 tab, 24 ref.

Descriptors: *Leaching, *Soil chemistry, *Forest soils, *Soil formation, *Leaves, Humus, Soil-water-plant relationships, Weathering.
Identifiers: *Aspen trees, Orthic black soils.

Cylinders filled with Orthic Black Soil material were leached over a 2-year period with distilled water or with aqueous extracts of aspen or black poplar leaves that were collected late in the growing season. Actual losses from the soil and chemical analyses of the leached soil indicated that the aqueous extract of aspen poplar leaves imposed greater changes on the chemical properties of the soil than did the extract of black poplar leaves. These changes were particularly noticeable for pH, total and exchangeable Ca, and 0.1N NaOH-extractable C. The aqueous extract of aspen poplar leaves acidified the soil more strongly than the extract of black poplar leaves, even though there was little difference between the two extracts in polyphenol and polysaccharide content and the total acidity of the black poplar extract was about twice that of the aspen poplar extract. Aqueous extract of weathered aspen poplar leaves was no more effective than distilled water. (Knapp-USGS)
W72-00583

MOVEMENT AND ADSORPTION OF PESTICIDES IN STERILIZED SOIL COLUMNS,
Florida Univ., Gainesville.
R. S. Mansell, and L. C. Hammond.
Florida University Water Resources Research Center Technical Completion Report, August 9, 1971. 63 p, 24 fig, 4 tab, 33 ref. OWRR Project A-013-FLA (1).

Descriptors: *Water pollution sources, *Herbicides, *Soil water movement, *Soil properties, *Adsorption, Florida, Anion adsorption, Cation adsorption, Water purification, Pesticide kinetics, Hydrogeology, Mathematical studies, Equations, Soil chemistry, 2-4-D, Paraquat.
Identifiers: *Sterilized soil columns.

Rapid transport of systematic and soil sterilant herbicides in soil during periods of net water flow may decrease the effectiveness of the chemicals to control unwanted vegetation and produce undesirable pollution of the groundwater. The influence of physical-chemical soil properties upon the transport of 2,4-D and paraquat in columns of organic and sandy soils was investigated. These herbicides are water soluble organic chemicals which are used extensively in agriculture. The toxicant portions of 2,4-D and paraquat behave as anion and cation, respectively. Miscible displacement of aqueous solutions of these herbicides through columns of Everglades mucky peat resulted in most of the 2,4-D and all of the paraquat being removed from solution by adsorption. Limited transport of 2,4-D was observed for the same fine sands. Very small quantities of organic matter in the fine sands effectively removed paraquat from the flowing soil solution. The presence of large concentrations of KCl in the soil solution decreased the quantity of paraquat sorbed. Mathematical transfer function theory was used in connection with statistical hydrodynamics to develop a technique for analysis and prediction of herbicide elution from soil columns during miscible displacement experiments. (Woodard-USGS)
W72-00589

AREAL VARIATION OF SOIL VARIABLES AND IMPLICATIONS RELATIVE TO THE INTERFLOW PROCESS,
Clemson Univ., S.C. Dept of Agricultural Engineering.
L. R. Wang.
M Sc Thesis, December 1970. 70 p, 13 fig, 10 tab, 16 ref, 2 append. OWRR B-008-SC (2).

Descriptors: *Soil water movement, *Soil properties, *Subsurface runoff, *Model studies, Laboratory tests, Analytical techniques, Mathematical studies, Equations, Hydrologic data, Soil moisture, Hydraulic conductivity, Diffusion, Soil physics.
Identifiers: *Interflow process.

Interflow is an important contributor to stream flow. A statistical analysis was made to obtain values of areal variation of soil characteristics for soil samples taken from one classification in order to predict interflow precesses. The soil chosen was

Cataula Sandy Loam located above five miles south of Clemson University, South Carolina. Soil characteristics measured were bulk density, saturated hydraulic conductivity, moisture content and tension relationship, particle size distribution, and unsaturated hydraulic conductivity-tension relationship. The data obtained were put into a computer program to calculate the mean values, standard deviations, and 95% confidence intervals. In order to determine whether there is any mathematical relationship among some sets of soil characteristics, the least squares method was used to get regression lines, correlation coefficients, estimators for population variances, and confidence intervals for certain combinations of soil variables. (Woodard-USGS)
W72-00607

EFFECT OF SOIL MOISTURE PRESSURE ON RELATIVE EVAPORATION (IN RUSSIAN),
For primary bibliographic entry see Field 02D.
W72-00669

WATER STATUS OF SOD-PODZOLIC SANDY SOILS ON DEEP SANDS IN POLESIE (IN UKRAINIAN),
P. M. Polyv'yanyi.
Nauk Pr Ukr Silkohospod Akad. 20. 35-41. 1968. Russian summary.
Identifiers: Deep, Fertilizers, Leaching, Mineral, Organic, Podzolic, Polesie, Sands, Sandy, Sod, Soils, USSR.

A characteristic feature of sod-podzolic sandy soils on thick sand deposits is the flushing type of their water regime. Mineral and organic fertilizers are washed away from cultivated soils throughout the frost-free period.--Copyright 1971, Biological Abstracts, Inc.
W72-00670

CHARACTERISTICS OF ERODED SOILS IN THE RIGHT-BANK FOREST STEPPE IN THE UKRAINIAN SSR, (IN UKRAINIAN),
For primary bibliographic entry see Field 02J.
W72-00671

MOBILITY OF NUTRIENTS UNDER DIFFERENT MOISTURE CONDITIONS IN SOILS, (IN RUSSIAN),
A. N. Ponomarev.
Tr Vses Nauch-Issled Inst Udobr Agropochvoved. 45. 323-330. 1968.
Identifiers: Mobility, Moisture, Nutrients, Soil.

In pot experiments with irrigated light-chestnut soil, mobility of P on composting was independent of the soil moisture content; it decreased mainly due to water-soluble P, which was strongly affected by soil desiccation. Accumulation of nitrates depended largely on the moisture content and aeration of soil. Mobility of K was only slightly affected by the moisture content and desiccation of soil.--Copyright 1971, Biological Abstracts, Inc.
W72-00674

VARIATION OF THE CHEMICAL PROPERTIES OF CHESTNUT SOILS WITH AND WITHOUT IRRIGATION, (IN RUSSIAN),
A. M. Byalyi, V. I. Azovtsev, and V. M. Kretinin.
Byull Vses Nauch-Issled Inst Agrolesomelior. 3 (55): 47-50. 1968. English summary.
Identifiers: Chemical, Chestnut, Irrigation, Soils, USSR.

Studies were made of the variation coefficient of agrochemical properties of chestnut soils in the lower Volga area on leveled, irrigated and nonirrigated plots. A table is provided for accuracy in determination of agrochemical parameters as a function of the number of samples and the coefficients of variation on 3 significance levels. The number of replications of soil sampling may be determined beforehand, provided the coefficient of variation has been calculated.--Copyright 1971, Biological Abstracts, Inc.
W72-00675

AGROCHEMICAL AND BIOLOGICAL FEATURES OF ERODED SOILS, (IN UKRAINIAN),
For primary bibliographic entry see Field 03F.
W72-00676

AGROCHEMICAL AND BIOLOGICAL FEATURES OF ERODED SOILS, (IN UKRAINIAN),
For primary bibliographic entry see Field 02J.
W72-00677

EFFECT OF MOISTURE REGIME ON REDOX STATE OF ADZHARIAN RED AND YELLOW EARTHS, (IN RUSSIAN),
L. L. Shishov.
Tr Univ Druzhby Nar Im Patrisa Lumumby. 35 (2): 89-100. 1968. English summary.
Identifiers: Adzharian, Earths, Moisture, Red, Redox, Regime, USSR, Yellow.

In a study of the effects of a short-term (3-days) heavy wetting and a long-term (3-33 days) heavy and excessive wetting upon redox potential (Eh), the soils were desiccated to 44-74% field moisture capacity, satisfactorily aerated and maintained at a high oxidation level. Field moisture capacity fluctuated from 450-580 millivolts (mV). Transient wetting did not interfere with aeration but slightly reduced the Eh (10-10 6 mV). The highest stability of the redox state was in soils on elevated reliefs. Prolonged wetting at field capacity caused anaerobiosis and reduced Eh to 227-267 mV. The largest reduction of Eh and accumulation of ferrous Fe occurred at a moisture content of 120% of field capacity.--Copyright 1971, Biological Abstracts, Inc.
W72-00678

SOIL STICKINESS AS A FUNCTION OF ITS MOISTURE CONTENT, (IN RUSSIAN),
N. A. Yakubov.
Nauch Tr Tashkent Univ. 388. 138-140. 1968.
Identifiers: Function, Moisture, Soil, Stickiness, USSR.

Soil stickiness was determined in the arable and lower horizons of nonsaline (or weakly saline) irrigated meadow and alluvial soils in the Khorezm Region. Stickiness of medium loamy soils increased with increasing moisture content. The sticking of soils to the metal parts of agricultural machinery decreased abruptly with the appearance of free moisture in the soil.--Copyright 1971, Biological Abstracts, Inc.
W72-00679

EFFECT OF SHELTERBELTS ON THE CONTENTS OF HUMUS AND NITROGEN IN SOIL, (IN RUSSIAN),
Z. M. Selyanina.
Byull Vses Nauch-Issled Inst Agrolesomelior. 3/55. 26-28. English summary.
Identifiers: Humic-Acid, Humus, Nitrogen, Shelterbelts, Soil.

The humus content and the C/N ratio increased, and humic acid prevailed over fulvic acids.--Copyright 1971, Biological Abstracts, Inc.
W72-00680

EFFECT OF SOIL MOISTURE STRESS ON UPTAKE AND RECOVERY OF TAGGED NITROGEN BY WHEAT,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 03F.
W72-00687

A STUDY OF NEW ZEALAND WHEATS: III, EFFECTS OF SOIL MOISTURE STRESS AT DIFFERENT STAGES OF DEVELOPMENT,
Lincoln Coll., Canterbury (New Zealand).
For primary bibliographic entry see Field 03F.
W72-00688

SOME ASPECTS OF THE MINERAL NUTRITION OF CULTIVATED PLANTS OF THE FLUVIAL-LACUSTRINE SOILS FROM THE DANUBE FLOOD PLAIN. 1. CORN, (IN RUMANIAN),
Institutul Agronomic, Bucharest (Rumania).
For primary bibliographic entry see Field 03F.
W72-00692

STUDIES ON THE RELATIONSHIP BETWEEN MISCANTHUS SINENSIS COMMUNITY AND SOIL: I. RELATIONSHIP BETWEEN PRODUCTIVITY OF MISCANTHUS SINENSIS GRASSLAND AND MICROTOPOGRAPHY,
Kobe Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 02I.
W72-00721

TENTATIVE EXPLANATION OF DWARFISH GROWTH OF PLANTS ON SERPENTINE SOILS: I. PHYSICOCHEMICAL AND BIOLOGICAL PROPERTIES, AND MINERAL ELEMENTS OF SERPENTINE SOILS (IN POLISH),
Wroclaw Univ. (Poland). Dept. of Plant Physiology.
J. Sulej, E. Slesak, K. Leonowicz-Babiak, and Buczek.
Acta Soc Bot Pol. 39 (3): 405-419. 1970. English summary.
Identifiers: Biological, Calcium, Charlock-D, Clover-D, Dwarfish, Elements, Explanation, Growth, Magnesium, Mineral, Physicochemical, Plants, Radish-D, Ratio, Serpentine, Soils, Tomato-D.

These soils have a poorly developed structure and unfavorable water conditions. Their pH is neutral. They contain a small amount of basic mineral components and large quantities of Fe, Ni and Al. The ratio of Ca:Mg ions is very abnormal. It inhibits growth and reduces weight increment. The abnormal Ca and Mg ion ratio is the chief reason of the dwarfness. The Ca:Mg ratio ranged between 1:6 and 1:20 (average 1:10), while for cultivated soils it lies within 1:1 to 3:1. This ratio affects the balance of mineral N, by disturbing N metabolism or affecting assimilation of mineral N. This hypothesis is based on following observations: such plants as clover, which may assimilate N independently of the resources of mineral N were insensitive to the abnormal Ca to Mg ions ratio, whereas plants which assimilate only mineral N were strongly affected, (charlock, radish, tomato) and responded by crop reduction and growth inhibition.--Copyright 1971, Biological Abstracts, Inc.
W72-00727

'FOAM' SOILS AS THE CAUSE OF ABSENCE OF VEGETATION IN ARID LANDS ('SCHAUMBODEN' ALS URSACHE DER VEGETATIONSLOSIGKEIT IN ARIDEN GEBIETEN),
Wuerzburg Univ. (West Germany). Inst. of Pharmacognosy; and Goettingen Univ. (West Germany). Systematisch-Geobotanisches Institut.
O. H. Volk, and E. Geyger.
Zeitschrift fur Geomorphologie, Vol 14, No 1, p 79-95, 1970. 9 fig, 1 tab, 30 ref.

Descriptors: *Soil texture, *Soil physical properties, *Arid lands, *Soil moisture, Vegetation, Soil types, Soil gases, Soil investigations, Soil structure, Soil environment, Rainfall, Runoff, Ecology, Environmental effects, Soil compaction, Permeability, Soil physics, Soil-water-plant relationships.

In many hot arid regions of the earth, bare areas devoid of vegetation often occur interspersed among vegetated areas. Lack of adequate precipitation is

obviously not the cause of such 'scalds'. Overgrazing, soil salinity and soil chemical properties are also considered and dismissed as possible causes. The unique 'foam' structure, a soil physical property marked by an accumulation of spheroidal vesicules with largely smooth walls, and isolated within the soil matrix, appears to be responsible for the lack of vegetation. Research in southern Spain, Morocco and SW Africa indicate that foam soils are found in very plastic materials (composed of fine sand-coarse silt low in clay) with narrow and well defined moisture limits. Formation of such soil textures occurs when the soil, turned muddy from a pounding rain, begins to dry. Air from lower soil layers is trapped and encapsulated, creating the peculiar porous structure. These air-filled pores prevent infiltration and increased runoff. Agricultural exploitation may be facilitated by breaking up the soil surface. (Casey-Arizona)
W72-00756

CAPILLARY PROPERTIES OF TEREK RIVER SANDS (O KAPILLYARNYKH SVOYSTVAKH PESKOV R. TEREK),
G. A. Derbinyan.
Pochvovedeniye, No 1, p 139-142, January 1971. 3 fig, 4 tab, 3 ref.

Descriptors: *Soil water, *Soil water movement, *Capillary action, *Sands, Alluvium, Capillary water, Particle size, Mineralogy.
Identifiers: *USSR, Caucasus, Terek River, Capillary properties, Capillary rise.

The results of experimental investigations of the capillary movement of water in alluvial sands on the left bank of the middle reach of the Terek River (Northern Caucasus) are described. The height of the capillary rise of water in the sands depends upon the content of particles 0.25-0.05 and 1-0.25 mm in diameter, which are the predominant fractions in the sand. The particle size of the sands effects the rate of the capillary rise of water. An increase in the number of finer particles leads to an increase in the rate of the capillary rise; conversely, the rate of this rise decreases as the sands become coarser. (Josefson-USGS)
W72-00809

REGULATING THE GROUNDWATER REGIME OF EXCESSIVELY WET LANDS (REZHIM GRUNTOVYKH VOD PEREUVLAZHNENNYKH ZEMEL' I YEGO REGULIROVANIYE),
B. S. Maslov.
Izdatel'stvo 'Kolos', Moscow, USSR, 1970. 232 p.

Descriptors: *Hydrogeology, *Groundwater, *Wetlands, *Moisture content, *Regulation, Groundwater recharge, Drainage practices, Drainage systems, Land reclamation, Bogs, Peat, Aquifers, Zone of aeration, Seasonal, Water temperature, Evaporation, Precipitation (Atmospheric), Infiltration, Water storage, Water levels.
Identifiers: *USSR, RSFSR, Ukraine, Belorussia, Lithuania, Latvia, Estonia, Georgian SSR, Siberia, Regionalization.

The natural groundwater regime of bogs, waterlogged lands, and excessively wet lands was examined to determine the optimum moisture content of the soil for farming and developing efficient drainage systems to ensure agricultural productivity. According to data published by the USSR Ministry of Agriculture, more than 91.4 million ha of agricultural lands require drainage improvement, including 12.4 million ha of plowed and fallow lands, 18.8 million ha of meadows and pastures, and 59.8 million ha of bogs. The distribution of these lands by republics is as follows: RSFSR--82.5%; Ukraine--5.9%; Belorussia--5.5%; Lithuania--2.6%; Latvia--2.2%; Estonia--1.15%; and Georgia--0.15%. The area of excessively wet land in such farming regions as the northwestern RSFSR, Lithuania and Western Siberia is 50-70%, and in the nonchernozem zone more than 30%, of all the agricultural land. As of November 1, 1969, only 7.82 million ha of land in the USSR or about 8.5% of the land in need of drainage had been drained. The costs of increasing the area of drained lands to an estimated 15-16 million ha in the next 10 years, and to 27 million ha by 1985, may generally be recovered in 2-6 years. (Josefson-USGS)
W72-00815

AN APPROXIMATE METHOD FOR DEFINING THE HYDRAULIC CONDUCTIVITY-PRESSURE POTENTIAL RELATIONSHIP FOR SOILS,
Purdue Univ., Lafayette, Ind.
R. W. Skaggs, E. J. Monke, and L. F. Huggins.
American Society of Agricultural Engineers Transactions, Vol 14, No 1, p 130-133, 1971. 8 fig, 16 ref. OWRR A-010-IND (8).

Descriptors: *Soil water movement, *Mathematical studies, *Hydraulic conductivity, *Soil properties, *Methodology, Infiltration, Flow rates, Pressure head, Equations.
Identifiers: Unsaturated soils.

Quantification of infiltration of water into soil is one of a broader class of problems involving the movement of water in unsaturated soil. The relationship between the hydraulic conductivity, K, and the pressure head, h, or the water content, is necessary for solving the governing equation. Conventional techniques for measuring K (h) are both difficult and time consuming. An approximate method for defining the conductivity function of unsaturated soil shows that the measurements required in the proposed method can be made a relatively short time and, unlike conventional techniques, there is a good possibility that this method can be adapted for in-place, field determination of K (h). An evaluation of the method utilizing soil property data from the literature for four separate soils is presented and discussed. (T. H. Woodard-USGS)
W72-00829

LYSIMETERS WITH RAINFALL AND SOIL WATER CONTROL,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
For primary bibliographic entry see Field 02D.
W72-00834

INFILTRATION UNDER MOVING SPRINKLERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-00886

MOVEMENT OF WATER THROUGH FINE SANDY LOAM SOIL UNDER SUBIRRIGATION AND DRAINAGE CONDITIONS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. Bernal.
Master of Science Thesis, 1971. 62 p, 20 fig, 5 tab, 37 ref. OWRR A-033-NC (2).

Descriptors: *Soil water movement, *Drainage, *Unsteady flow, *Saturated flow, *Subsurface irrigation, Analysis, Design criteria, Irrigation, Unsaturated flow, Laboratory tests, Hydraulic conductivity, Moisture content, Water table, Numerical analysis, Theoretical analysis, Drains, Equations.
Identifiers: Time variable flow, Predictions.

Analysis of water movement through soil is important to design criteria for irrigation and drainage, particularly under nonsteady or time-variable flow. Saturated and unsaturated flow were investigated under these conditions by field and laboratory determinations of hydraulic conductivity as a soil-water content function for a wide range of conditions. Water-table movement, responding to subirrigation and drainage, was measured and compared to numerical calculations. Theoretical solutions and observed field data were compared by 4 selected drain-spacing equations. Two solutions gave good predictions using field-determined conductivity. The field determination of conductivity proceed reliable. Hydraulic conductivity varied largely with depth. Figures include comparisons of observed and calculated water-table rise, cummulative infiltration curve, and hydraulic conductivity versus soil-water content. (Popkin-Arizona)
W72-00897

COMMENTS ON SOME OF THE PHYSICAL CHEMICAL QUESTIONS ASSOCIATED WITH THE ANALYSIS OF WATER IN EARTH MATERIALS,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 08H.
W72-00967

2H. Lakes

TURBULENCE IN LAKE HURON,
Sydney Univ. (Australia). Dept. of Mechanical Engineering.
I. S. F. Jones, and B. C. Kenny.
Water Research, Vol 5, No 9, p 765-776, September 1971. 8 fig, 3 tab, 10 ref.

Descriptors: *Turbulence, *Diffusion, *Lake Huron, *Water pollution, *Currents (Water), Current meters, Analytical techniques, Hydrologic data, Tracers, Dye releases, Path of pollutants, Mathematical studies.
Identifiers: *Diffusivity rates.

To improve the understanding of diffusive processes in large bodies of water, the instantaneous speed and direction of the current at a fixed point two meters below the surface of Lake Huron were measured during the summer of 1967. The root mean square of the current fluctuations, both in the streamwise and lateral directions, was of the order of 0.05 of the mean current but varied substantially from day to day. Based on three hour records, the Eulerian time scales were found to be of the order of 10 min while the Lagrangian time scales, calculated from diffusion studies in the same area the previous summer, were of the order of 40 min. (Woodard-USGS)
W72-00578

AN INVENTORY OF MEDIUM-SIZED LAKES IN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
Joe C. Wallace.
Geological Survey Open-file Report, 1970. 7 p, 1 fig, 1 tab.

Descriptors: *Lakes, *Hydrologic data, *Surveys, *California, *Lake morphometry, Surface waters, Water sources, Water yield, Volume, Acreage, Size, Watersheds (Basins).
Identifiers: *Lake inventory (Calif).

Lakes in California having a water surface area from 160 to 640 acres were inventoried. The 142 lakes listed have a combined surface area of 46,000 acres and store about 1.5 million acre-feet of water. The table of data includes name of lake, county, topographic map, coordinates (latitude-longitude), altitude of water surface (ft. above msl), area of water surface (acres), volume (acre-feet), drainage area (sq. mi.), outlet, outflow regulated (yes-no), and USGS identification number. (Woodard-USGS)
W72-00605

A BACTERIOLOGICAL STUDY OF A NEW THAMES VALLEY RESERVOIR,
Royal Holloway Coll., Englefield Green (England).
A. T. Price, and L. R. G. Valadon.
Microbios. 2 (7/8): 269-271. Illus. 1970.

Identifiers: Bacteriological, England, Fluctuation, Reservoir, Seasonal, Thames Valley.

Water from the River Thames at Walton, and the Queen Elizabeth II storage reservoir of the Metropolitan Water Board, London, England, was examined bacteriologically over a period of one year. A preliminary survey showed that bacterial numbers remained fairly constant in the reservoir over the year, with the exception of peaks during spring and summer. Over the same period, however, bacterial numbers in the River Thames which supplied the reservoir, fluctuated a great deal, probably due to rainfall over the drainage area.--Copyright 1971, Biological Abstracts, Inc.
W72-00702

THE BENTHOS OF THE ARAKUM RESERVOIR DURING ITS FIRST YEAR, (IN RUSSIAN),
M. K. Guseinov.
Biol Vnutr Vod Inform Byull. 3. 13-17. 1969.
Identifiers: Arakum, Benthos, Chironomids, Dynamics, Earthworms, Polypedilium-Nuberculosum, Population, Reservoir, St, Tendipes-Plumosus, USSR, Vegetation, Year.

The area of the Reservoir is 18,000 ha, and flooded land accounts for about 85% of the bottom. Over most of its area the depth is no greater than 1.5-2 m; there is no current; the transparency of the water in quiet weather is 1.6 m according to the Secchi disk. Beginning in June there was mass development of the aquatic vegetation, especially in the shallows. The zoobenthos was collected at 21 stations in different biotopes with a Petersen bottom scoop having a catch area of 1/40 sq m. In samples taken from flooded ground 1 mo. after flooding (10 May 1965), 90% were earthworms. In 10 days the number decreased to insignificance, but note was made of a greater variety of chironomid larvae, whose biomass reached 4-5 g/sq m; by the end of May their biomass had reached 10-15 at some stations. Most numerous were Tendipes plumosus and Polypedilum gr. nubeculosum. Note was made in June of a sharp decline in the size of the chironomid population. Then this population and the biomass remained at a low level, evidently because of a shortage of food. Note was made in Jan. of a new rise in the population size and biomass of chironomids (the average biomass was 1.22 g/sq m) which was caused by the accumulation of detritus. With the appearance of vegetation, the phytophilic fauna began to take on greater importance. In areas of lowland flooding at the beginning of summer there was predominance of the phytophilic fauna; in summer some decrease was observed in the phytophiles; and they increased again in fall and winter. Generally, the assumption of form by the benthos of the Arakum Reservoir occurred as in the Volga reservoirs, but at faster rates because of higher water temperatures and more extensive shallows in the water.--Copyright 1971, Biological Abstracts, Inc.
W72-00706

THE SEASONAL DYNAMICS OF THE PRODUCTIVITY OF THE PLANKTON OF THE SHORE AREA AND THE OPEN PART OF THE VOLGA ARM OF THE RYBINSK RESERVOIR, (IN RUSSIAN),
Y. I. Sorokin.
Biol Vnutr Inform Byull. 3. 7-10. 1969.
Identifiers: Algae, Arm, Bacteria, Blue-Green, Diatoms, Dynamics, Phyto, Plankton, Productivity, Reservoir, Rybinsk, Seasonal, Shore, USSR, Volga, Zoo.

In 1967 a series of seasonal observations were completed on the dynamics of the principal variables of the production of phytoplankton and bacteria and the population size of the zooplankton; the phytoplankton production was determined by the radiocarbon method. Bacterial production was determined by a direct count of the change in population size in water samples isolated from zooplankton. The zooplankton population size was determined in samples after straining 100 l of water through a plankton net. The depth in overgrown shallows was 0.3-1 m, in open shallows 1.5-2.5 m, and in the open part of the deeper waters 8-12 m. The samples were collected at 10- to 20-day intervals. Little difference was found between the shore and open portions of the area with respect to the primary production of phytoplankton and bacteria and the zooplankton population size. Similarities were also found in the seasonal dynamics of the biological phenomena. The spring irruption of bacteria was absent; their active reproduction was observed in the middle of June and the middle of Aug. during the period when diatoms and blue-green algae were drying off. In spring the zooplankton developed at the expense of the phytoplankton. A 2nd irruption of zooplankton was caused by reproduction of the bacteria. The shore vegetation was noted to play only an insignificant role in the productivity of the shore area of the reservoir; this is explained by the inconstancy of the conditions.--Copyright 1971, Biological Abstracts, Inc.
W72-00708

THE LAKE FAUNA OF VELIKOE ISLAND AND THE KINDO PENINSULA OF THE GULF OF KANDALAKSHA IN THE WHITE SEA (IN RUSSIAN),
E. I. Kachanov-L'Vova Izvekova, and N. Y. Sokolova.
Tr Belomorsk Biol Sta Mosk Gos Univ. 3: 113-148. 1970.
Identifiers: Amphipods, Asplanchna-Priodonta, Chaoborus, Chironomids, Ephemeropterans, Fauna, Gulf, Holopedium-Gibberum, Island, Kandalaksha, Kindo, Lake, Mollusks, Peninsula, Pisidium, Rotifers, Sea, USSR, Velikoe, White.

Summers from 1962 and 1966 studies were made of 9 lakes. The zooplankton was collected with a 64-mesh Juday net, the benthos with an Echman-Berge bottom scoop (1/40 sq. m). Two hundred nineteen spp. and forms of invertebrates were found. Lake Bol'shoe and Maloe Kuzmyazh'i are deep (down to 11 m), with current having cold water, transparent down to 4 m, with favorable O2 conditions and water with a slightly alkaline reaction. Most numerous among the plankton were the rotifers, but the greatest biomass was that of the copepods. The mean biomass of plankton was 0.5 g/cu. m. In the benthos the chironomid larvae were the most numerous, but the greatest biomass was that of bivalve mollusks, ephemeropterans, and amphipods. The mean biomass of the benthos was 1-3 g/sq. m. Lakes Mortsy and Trostnivovoe are drainage lakes with a considerable influx of water from bogs. Temperature and oxygen stratification are observed in summer. The waters are transparent down to 1-1.7 m, and pH of the water is slightly acid. The biomass is 3 to 17.32 g/cu. m, owing to Holopedium gibberum and Asplanchna priodonta. In the benthos chironomids predominate with an average biomass of 2.2 to 11.5 g/sq. m. Lakes Maloe Eremeevskoe and Vodoprovodnoe are drainage-type dystrophic lakes of low transparency and have water with an acid reaction (pH 6.2-6.3). Rotifers are most numerous in the zooplankton; in the biomass cladocerans and Chaoborus predominate. The benthos is very slight (0.5 g/sq. m) and uniform; Pisidium predominates. The remaining 3 lakes occupy an intermediate position between these types, except for the undrained lake Gigantov, whose fauna is larger. The maximum biomass of the zooplankton is 42.2 g/sq. m.--Copyright 1971, Biological Abstracts, Inc.
W72-00713

BIOMETRIC STUDIES IN THE DENSE STANDS OF REEDS OF THE LAKE OF NEUSIEDL (AUSTRIA) (IN GERMAN).
Vienna Univ. (Austria). Pflanzenphysiologisches Institut.
Maria Geisslhofer, and Karl Burian.
Oikos. 21 (2): 248-254. Illus. Map. 1970. English summary.
Identifiers: Austria, Biometric, Dense, Depth, Fresh, Lake, Length, Neusiedl, Phragmites-Communis-M, Reeds, Shoot, Stands, Weight.

Reed Phragmites communis plants from the dense stands of the reed belt near Rust (lake of Neusiedl, Burgenland, Austria) were investigated by means of dry weight analyses and biometric measurements. Plants attain maximum fresh weight before the absolute maximum of dry weight. Dry weight rises in spite of the decline of fresh weight after the June climax. Maximum values for dry weight and leaf area development are reached simultaneously. Reed productivity is also decreasing during the time of leaf area maximum. The 20 cm zone of maximum assimilation area, situated at first near the shoot apex, begins to sink, after a short delay, toward the middle of the shoot, as elongation of the apical zones of the shoot becomes relatively larger than the increase in leaf area. A biometrically evaluated transect through reed belt to the free surface shows a distinct inverse relationship between water depth and shoot length, and between water depth and assimilation area.--Copyright 1971, Biological Abstracts, Inc.
W72-00714

LITTORAL ALGAE OVERGROWTH ON A PELAGIC SUBSTRATE IN LAKE CONSTANCE (GERMANY, SWITZERLAND),
Anstalt Bodenseeforschung, Konstanz (West Germany).
Hubert Lehn.
Beit Naturkundlichen Forsch Sudwestdeut. 27 (2): 97-100. Illus. 1968.
Identifiers: Algae, Constance, Diatoma-Vulare, Fragilaria-Capucina, Germany, Lake, Littoral, Melosira, Overgrowth, Pelagic, Substrate, Switzerland.

Benthic algae growing on a thermometer buoy in Lake Constance were examined during the reduction of phytoplankton production occurring in early summer. The growth on the buoy, which was anchored at depth of 65 m, offered a good sampling of vertical distribution of the algae. The algae had drifted from the shore area. Green algae occurred only in the upper regions where the light was stronger; diatoms were found from the upper regions to depths of 40 m. Taxa with the greatest vertical distribution were Melosira, Diatoma vulgare and Fragilaria capucina. Diatoms were dominant. Species with the greatest vertical distribution were the most frequent species in Lake Constance.--Copyright 1971, Biological Abstracts, Inc.
W72-00718

NORMAL CONTENTS AND ACCUMULATIONS OF COPPER IN PHRAGMITES COMMUNIS L. AS A RESPONSE TO THOSE IN THE SEDIMENTS OF SIX ITALIAN LAKES,
Giuseppe Chiaudani.
Mem Ist Ital Idrobiol Marco Marchi. 25: 81-95. Illus. 1969. English summary.
Identifiers: Accumulations, Bolsena, Bracciano, Copper, Industrial, Italian, Lakes, Maggiore, Mergozzo, Orta, Phragmites-Communis-M, Pollution, Sediments, Vico.

Increased contents of Cu in Lake Orta sediments due to industrial pollution determine accumulation in stems and roots of Phragmites communis L., but not in leaves. In other lakes (Maggiore, Mergozzo, Bolsena, Bracciano and Vico), significant correlations between the Cu contents of sediments and different parts of the plant were obtained.--Copyright 1971, Biological Abstracts, Inc.
W72-00720

CHANGES IN YELLOW BASS REPRODUCTION ASSOCIATED WITH ENVIRONMENTAL CONDITIONS,
Iowa Cooperative Fish Unit. Iowa State Univ., Ames.
Ross V. Bulkley.
Iowa State J Sci. 45 (2): 137-180. Illus. 1970.
Identifiers: Aeromonas-Salmonicida, Bass, Environmental, Fecundity, Furunculosis, Morone-Mississippiensis, Reproduction, Yellow.

Gillnet collections of yellow bass, Morone mississippiensis, were made from April 1967 to Sept. 1968 at Clear Lake, Iowa, to determine the normal reproductive cycle and variations in fecundity that could be related to changes in food supply and water temperatures. A major mortality from Aeromonas salmonicida occurred in May 1968 and allowed documentation of changes in body condition, fecundity and success of reproduction during the year preceding a mass mortality from furunculosis. Spawning was initiated during mid-May in 1967 and late April in 1968 when water temperatures approached 15 deg. C after a rapid temperature rise of 3.5 to 4.5 deg. C over several days. At spawning time, ovaries of adult bass constituted up to 16% body weight and testes up to 8% body weight. Maturing ova had a mean diameter of 0.4 mm in the preserved state when fish commenced spawning. Fresh ovulated ova averaged 0.8 plus or minus 0.11 mm in diameter. Wide variation in effective fecundity was evident among mature females of similar length. Although 50% of the variation in fecundity could be attributed to body length in 1967, the relation was not significant in 1968 (r — 0.32). In 1967, mature females contained an average of 560 mature ova per mm total body length in contrast to 276 ova in 1968. In terms of body weight, the average female produced 835 ova per gram body weight in 1967 but only 350 in 1968. The reduction in fecundity was attributed to poor body condition in 1968. Females measuring 200 mm total body length weighed approximately 137 g in 1967 at spawning time but only 115 g in 1968. Atresia of developing ova was estimated at 20% during the period from Dec. to May and was attributed to poor nutrition. Ova retention after spawning in 1967 was approximately 34% of total ova production. In 1968 most fish died shortly after initiation of spawning, with a minimum number of ova shed. Reproduction success in 1968 determined by standardized seining of young-of-the-year bass was 1% of the 1967 level (77 vs. 7015). Young-of-the-year yellow bass were a major food item of adult bass during late summer and autumn when gonadal development was initiated. At other times adult bass ate invertebrate food similar to that of young bass. Mesenteric fat decreased steadily with gonadal development in both sexes from March to May 1968 and reached zero levels at spawning time. Insufficient food, as reflected by poor body condition, coupled with fluctuating spring water temperatures seemingly allowed furunculosis to reach epizootic proportions when spawning commenced in 1968. The yellow bass population was decimated by the disease, but mortality of other species was not observed. Catch per gillnet hour decreased from 2.158 bass in mid-May to 0.025 in mid-June and 0 by the end of July.--Copyright 1971, Biological Abstracts, Inc.
W72-00736

STUDIES OF THE FISH FAUNA OF THE NEWLY CREATED LAKE NEAR VEERE WITH SPECIAL EMPHASIS ON THE PLAICE (PLEURONECTES PLATESSA),
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
K. F. Vaas.
Neth J Sea Res. 5 (1): 50-95. Illus. Maps. 1970.
Identifiers: Fauna, Fish, Fishery, Lake, Netherlands, Plaice, Pleuronectes-Platessa, Populations, Veere.

After a brief description of the way a new lake was created near Veere in 1961 by the construction of 2 dams in a side-arm of the Oosterschelde, the changes in the fish fauna are described. As a result of the abrupt disruption of the contact with the coastal sea water, many species which were formerly temporary residents of the open sea-arm, left the area. Its effect on the population dynamics and fishery of plaice is discussed.--Copyright 1971, Biological Abstracts, Inc.
W72-00745

RESERVOIRS OF HYDROELECTRIC POWER PLANTS OF THE USSR (VODOKHRANILISHCHA GIDROELEKTROSTANTSIY SSSR),
For primary bibliographic entry see Field 04A.
W72-00814

FIELD STUDY OF EVAPORATION: NOTES ON THE EXTRACTION AND COMPUTATION OF DATA.
Snowy Mountains Engineering Corp.
For primary bibliographic entry see Field 02D.
W72-00888

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART I AND II.
Great Lakes Research Center, Detroit, Mich.

Available from Treasurer, P. O. Box 640, Ann Arbor, Mich. 48107. Price $18.00 a set. 1970. 1063 p.

Descriptors: *Great Lakes, *Lakes, Eutrophication, Algae, *Lake Superior, *Lake Michigan, *Lake Huron, *Lake Ontario, *Lake Erie, Water pollution effects, Water pollution sources, Limnology.

The Thirteenth Conference on Great Lakes Research was held 1-3 April, 1970 at Buffalo, New York and co-hosted by Cornell Aeronautical Laboratory Inc. and the Great Lakes Laboratory of the State University College at Buffalo. (See also W72-01095 thru W72-01112)
W72-01094

LASER INDUCED FLUORESCENCE IN RHODAMINE B AND ALGAE,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 05C.
W72-01095

A MATHEMATICAL ANALYSIS OF THE NICHES OF LAKE MICHIGAN ZOOPLANKTON,
State Univ. of New York, Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-01096

BLUE-GREEN ALGAE AND HUMIC SUBSTANCES,
Cincinnati Univ., Ohio. Tanner's Council Lab.
For primary bibliographic entry see Field 05C.
W72-01097

DISTRIBUTION OF FRESHWATER TRICLADS (PLATYHELMINTHES: TURBELLARIA) IN CENTRAL-SOUTHERN ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-01098

SURVEY OF PHYTOPLANKTON PRODUCTIVITY AND NUTRIENTS IN LAKE MICHIGAN AND LAKE SUPERIOR,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05C.
W72-01099

A QUANTITATIVE METHOD FOR THE DETERMINATION OF CHLORIN PIGMENTS IN GREAT LAKES SEDIMENT,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05C.
W72-01100

NEUTRON ACTIVATION ANALYSIS OF SEDIMENTS IN WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Coll. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-01101

CIRCULATION PATTERNS AND A PREDICTIVE MODEL FOR POLLUTANT DISTRIBUTION IN LAKE ERIE,
New York State Univ., Buffalo.
For primary bibliographic entry see Field 05C.
W72-01102

FORMATION OF THERMOCLINE IN GREAT LAKES,
Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
Ting Y. Li.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 453-467, 1970. 5 fig, 13 ref.

Descriptors: *Lakes, *Thermocline, *Mathematical models, Flow, Mixing, Turbulence, Great Lakes, Temperature, Equations, Winds, Convection.
Identifiers: *Vertical mixing velocity, Conservation equations.

The thermal structure and dynamics of water basins are interpreted in terms of Ekman type equations for horizontal motion and Burgers' model for vertical turbulence. Solutions provide estimates of the thermocline formation in the Great Lakes. The development of the spring-summer thermocline is explained by the wind-induced heat diffusion waves. Speed of thermocline propagation is directly related to wind velocity. (See also W72-01094) (Wilde-Wisconsin)
W72-01103

DISPERSAL OF FOX RIVER WATER IN GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
Richard F. Modling, and A. M. Beeton.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 468-476, 1970. 2 fig, 5 tab, 12 ref.

Descriptors: *Water circulation, *Bays, *Rivers, Conductivity, Water pollution effects, Lake Michigan.
Identifiers: *Water mass movement, Green Bay (Wis), Fox River (Wis), Flushing rates.

The effects of Fox River inflow on water of the southern part of Green Bay (Wisconsin) were investigated by surveys conducted in July 1968, and August 1969. Dilution of the polluted river water in its lakeward flow was determined on the basis of specific conductance which ranged from 400 at the river's mouth to 265 micro/mhos along the Menominee-Sturgeon Bay transect. The counterclockwise movement of the river water along the east side of the bay was marked by concentration of electrolytes, presence of Daphnia pulex inhabiting Lake Winnebago, absence of oxygen-demanding oligochaetes and Hexagenia, and organic matter sediment enrichment. The river water extension into the bay approached 40 miles. The 1969 flushing was 160 days in the southern and 36 days in the northern part of the study area. Lakeward transport was 199 at Oconto transect, and 1130 m/day at Cedar River transect. (See also W72-01094) (Wilde-Wisconsin)
W72-01104

DRY WEIGHT OF THE MACROBENTHOS AS AN INDICATOR OF EUTROPHICATION OF THE GREAT LAKES,
California State Coll., Los Angeles. Dept. of Zoology; and Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05C.
W72-01105

PLANKTON PRODUCTIVITY STUDIES IN LAKE ST CLAIR,
Windsor Univ. (Ontario). Dept. of Biology; and Wayne State Univ., Detroit, Mich. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-01106

DISTRIBUTION OF TRACE ELEMENTS AND CHLOROPHYLL-A IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05B.
W72-01107

AQUEOUS PHOSPHATE AND LAKE SEDIMENT INTERACTION,
Great Lakes Research Center, Detroit, Mich.
For primary bibliographic entry see Field 05C.
W72-01108

ENGINEERING CONSIDERATIONS OF A EUTROPHIC WATER BODY,
Syracuse Univ., N.Y. Dept. of Civil Engineering; and O'Brien and Gere Engineers, Inc., Syracuse, N.Y.
For primary bibliographic entry see Field 05C.
W72-01109

NUTRIENTS IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington, (Ontario). Canada Centre for Inalnd Waters.
For primary bibliographic entry see Field 05C.
W72-01110

2I. Water in Plants

ANNUAL CYCLE OF LEAF WATER POTENTIAL IN PICEA ENGELMANNII AND ABIES LASIOCARPA AT TIMBERLINE IN WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
J. H. Lindsay.
Arctic and Alpine Research, Vol 3, No 2, 1971. p 131-138, 2 fig, 4 tab, 14 ref. OWRR A-001-WYO (48).

Descriptors: *Moisture stress, Leaves, Plants, Trees, Wyoming, Transpiration, *Plant growth.
Identifiers: Medicine Bow Mountains (Wyo), *Leaf water stress, *Needles, Picea engelmannii, Abies lasiocarpa, *Tree growth.

Leaf water potential of Picea engelmannii and Abies lasiocarpa was measured throughout the year in the Medicine Bow Mountains, Wyoming. Winter-exposed needles of trees at timberline (3,300 m) exhibited severe water stress during the winter (-30 to -35 bars water potential) while winter-protected needles of trees at timberline and needles of trees at lower elevations (2,990 m) exhibited less stress (-18 to -20 bars water potential). The winter stress of the timberline trees appeared to be the result of the interaction of primarily two factors, the strong winds which increased transpirational losses and the cold soil which inhibited absorption of water. Leaf water stress appears to be a significant limiting factor of tree growth at timberline in the central Rocky Mountains.
W72-00638

GROWING ROSE PELARGONIUM UNDER CONDITIONS OF OPEN HYDROPONICS, (IN RUSSIAN),
Akademiya Nauk Armyanskoi SSR, Erevan. Institut Agrokhimicheskikh Problem i Gidroponiki.
G. S. Davtyan, and S. K. Mairapetyan.
Agrokhimiya. 4. 96-100. Illus. 1970.
Identifiers: Growing, Hydroponics, Oil, Open, Pelargonium-D, Production, Rose.

Three years of experiments showed the high effectiveness of the hydroponic cultivation of rose pelargonium. Under conditions of open hydroponics it is possible to increase greatly the yield of essential oil up to 200 kg/ha as compared with the 20-30 kg/ha that is obtained from the usual soil method of growing rose polargonium. Tasting, as well as data from physicalchemical analyses, show the high quality of the essential oil obtained from rose polargonium grown under the conditions of hydroponics.--Copyright 1971, Biological Abstracts, Inc.
W72-00686

THE SAGUENAY FJORD: THE ICHTHYOLOGICAL FAUNA AND THE ECOLOGICAL CONDITIONS, (IN FRENCH),
Joliette Coll. (Quebec).
For primary bibliographic entry see Field 02L.
W72-00695

HABITATS AND ZOOGEOGRAPHY OF ALPINE TUNDRA ARACHNIDA AND CARABIDAE (COLEOPTERA) IN COLORADO,
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
Ronald R. Schmoller.
Southwest Natur. 15 (3): 319-329. 1971.
Identifiers: Alpine, Arachnida, Beetles, Carabidae, Coleoptera, Colorado, Geography, Habitats, Mites, Phalangids, Spiders, Tundra, Vegetation, Zoo.

Between 3500 and 4270 m elevation (11,500-14,000 ft) 174 pitfall jars were placed in a variety of habitats. In 1967, 71 spp. and 16,342 specimens of spiders, phalangids, mites, and ground beetles were collected. Species within the same genus usually occur in different habitats, as defined by vegetation cover and soil moisture. All tundra species, for which adequate records exist, also occur at elevations below tree-line. Accidental species of spiders may occur on the tundra, after having blown up from lower elevations. Three spp. of arachnids differ in mean adult size between 3650 m and 4270 m elevation. Many Colorado alpine tundra arachnid and carabid species also occur on other Nearctic mountains and in the northern taiga. The same spider genera and families dominate arctic and alpine tundra areas on several different continents.--Copyright 1971, Biological Abstracts, Inc.
W72-00697

CONTROL OF PRESPAWNING BEHAVIOUR OF SUNFISH (LEPOMIS GIBBOSUS AND LEPOMIS MEGALOTIS): II. ENVIRONMENTAL FACTORS,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
R. J. F. Smith.
Anim Behav. 18 (3): 575-587. Illus. 1970.
Identifiers: Behavior, Control, Environmental, Factor, Gonadotropin, Lepomis-Gibbosus, Lepomis-Megalotis, Photoperiod, Pre, Spawning, Sunfish, Temperature.

Male longear (L. megalotis) and pumpkinseed (L. gibbosus) sunfish showed high levels of aggression when kept in 25 deg C water both long and short photoperiod. Lower water temperatures (11 deg to 13 deg C) inhibited both aggression and nesting. Long photoperiod (16 hr light:8 hr dark) induced nesting by both species in 25 deg C water but only by longears in 11 deg to 13 deg C water. Short photperiod (8 hr light:16 hr dark) inhibited nesting in both species. Injection of human chorionic gonadotropin induced nest digging in both species under short photoperiod in 25 deg C water but not in 11 deg to 13 deg C water; HCG (human chorionic gonadotropin) had no obvious effect on aggression. Both species dug nests more readily in visual isolation than when in visual contact with conspecifics. Androgen secretion, as assayed by nest digging, is controlled by photoperiod. The level of aggression depends on water temperature and does not seem to be influenced by gonadotropins or androgens.--Copyright 1971, Biological Abstracts, Inc.
W72-00699

CANOPY DYNAMICS OF TREES AND SHRUBS WITH PARTICULAR REFERENCE TO ARID--ZONE TOPFEED SPECIES,
Northern Territory Administration, Allice Springs (Australia). Animal Industry Branch.
J. R. Maconochie, and R. T. Lange.
Trans Roy Soc S Aust. 94: 243-248. Illus. 1970.
Identifiers: Acacia-Sowdenii-D, Arid, Australia, Canopy, Cassia-Nemophila-Var-Coriacea-D, Cassia-Nemophila-Var-Platypoda-D, Dynamics, Feed, Heterodendrum-Oleaefolium-D, Myoporum-Platycarpum-D, Periodicity, Rainfall, Seasonal, Shrubs, Species, Top, Trees, Zone.

A study is reported in which foliage gain and loss was followed in canopies of tree and shrub populations. Data are presented tracing concurrently quantities and rates of leaf gains and losses in stands of 5 arid-zone topfeed species (Acacia sowdenii, Myoporum platycarpum, Cassia nemophia var. coriacea and var. Platypoda, Heterodendrum oleaefolium in stands at Yudnapinna, South Australia, during the period May 1965 to Jan 1967. These data are examined also with reference to time of year and rainfalls which occurred during the period. The performances of the 5 spp. are grouped into 3 categories characterized with respect to various features such as number of phases, synchronization of foliation and defoliation, and seasonal periodicity. The significance of both method and results in revealing canopy dynamics in arid regions is discussed.--Copyright 1971, Biological abstracts, Inc.
W72-00716

VEGETATIVE PROPAGATION IN SPIRODELA POLYRHIZA,
Banaras Hindu Univ., Varanasi (India). Dept. of Botany.
R. R. Das, and B. Gopal.
Trop Ecol. 10 (2): 270-277. 1969.
Identifiers: Adaptations, Physiological, Propagation, Spirodela-Polyrhiza-M, Temperature, Turions, Vegetative.

Spirodela polyrhiza (L.) Schleid., a lemanceous freshwater weed, propagates chiefly by vegetative means. The fronds multiply rapidly and double in number within 9-15 days. The vegetative propagules called turions which are modified daughter fronds, are produced twice in summer and winter in the Upper Gangetic Plains. The turions formed in summer sprout at temperatures both higher and lower than that at which they are formed but the winter turions sprout only at higher temperature. The turions lose viability on air drying. The turions do not exhibit any true dormancy and can be made to sprout by placing them at suitable temperature. A low temperature for short duration and chilling at sub-freezing temperature for 15-45 min promote sprouting. However, longer durations of the treatment are detrimental. Repeated chilling treatment in 24-hr cycle also increases sprouting percentage. The wide distribution of the species has been explained by demonstrating the existence of several physiologically adapted populations within the species, their wide tolerance range further amplified by stepped adaptability, and efficient means of reproduction.--Copyright 1971, Biological Abstracts, Inc.
W72-00719

STUDIES ON THE RELATIONSHIP BETWEEN MISCANTHUS SINENSIS COMMUNITY AND SOIL: I. RELATIONSHIP BETWEEN PRODUC-

TIVITY OF MISCANTHUS SINENSIS GRASSLAND AND MICROTOPOGRAPHY,
Kobe Univ. (Japan). Faculty of Agriculture.
Ryosei Kayama, Joji Yoshida, and Tomoharu Sakaida.
Jap J Ecol. 19 (4): 137-147. Illus. 1967. Japanese summary.
Identifiers: Aeration, Calcium, Community, Crop, Grassland, Micro, Miscanthus-Sinensis-M, Moisture, Potassium, Productivity, Relationship, Soil, Standing, Topography.

The areas studied are in the grassland of the Kuju Highland and of the outer rim of Mt. Aso. THE AREA OF THE Kuju Highland has an elevation of about 550-600 m and is situated on the gentle slope facing SW at the foot of Mt. Kuju. Eight plots were located linearly, considering the variation of the pH value of the soil as a rough indicator for different plant communities. When the variation of the pH values exceeded 0.1-0.2 the soil profile was studied. The Aso Highland area was situated on the SE slope, and in grassland dominated by Miscanthus sinensis about 3 km west of Daikanbo on the north portion of the outer rim of Mt. Aso. The soils in the 2 experimental areas contained sufficient water, particularly at the plots situated on the bottom of a gorge or near the base of a slope M. sinensis grassland seems to grow well in moist area. There is a problem of the balance between water and air. The water-air ratio in the soil may be a key for the productivity of the grasslands even when there is a little difference in nutrient level. In Kuju-Aso Highlands Ca at the surface layer is usually high in the place with a large standing crop. Exchangeable K increased more or less in the upper layer too. Plots having a large standing crops showed considerable exchangeable K.--Copyright 1971, Biological Abstracts, Inc.
W72-00721

THE PLANT COVER OF THE BIOKOVO MOUNTAINS IN DALMATIA,
Fran Kusan.
Prirodosl Istraz Acta Biol. 5 (37): 1-224. Illus. 1969.
Identifiers: Beech-D, Biokovo, Cover, Dalmatia, Mountains, Plant, Quercus-Ilex-D, Quercus-Pubescens-D, Xeromorphic, Yugoslavia.

In the Biokovo mountain area not only the evergreen but also the diciduous vegetation has a xeromorphic character. The predominance of these plants is due to the steep rocky and denuded nature of these coastal mountains. Woods are absent because of the dryness of the climate and thin soil. These adverse factors have prevented the development of a balanced plant cover over a longer period of time. As in other parts of Dalmatia evergreens occur predominantly in the coastal foothills. Characteristic for this vegetation is Quercus ilex. The transition from the evergreen to the deciduous zone is represented by Quercus pubescens which borders on the deciduous zone characterized by a poor growth of beech trees and shrubs. The highest elevations of the Biokovo mountains are in this zone. Subalpine meadows occur in spots and are poorly developed. Interesting species are found in inaccessible steep rock walls and on rock piles which represent autochthonous oreophytes surviving from the Tertiary period. The character of the plant cover of the Biokovo mountains is also found in Albania, Greece and in the Appenines.--Copyright 1971, Biological Abstracts, Inc.
W72-00723

STUDIES IN DECOMPOSITION OF LEAF LITTER OF IMPORTANT TREES OF TROPICAL DECIDUOUS FORESTS AT VARANASI, K. P. SINGH.
Meerut Univ. (India). Inst. for Advanced Studies.

Trop Ecol. 10 (2): 292-311. Illus. 1969.
Identifiers: Ash, Carbon, Deciduous, Decomposition, Di, Evolution, Forests, India, Leaf, Lignin, Litter, Nitrogen, Oxide, Ratio, Season, Trees, Tropical, Varanasi.

The decomposition rate of leaf litter of 10 important trees is presented. Litter decomposition was evaluated in terms of CO2 evolution, changes in C, N and C/N ratio of different species. With the onset of rains in the last week of June the litter decomposed rapidly, as evidenced by rapid CO2 evolution and a decrease in C/N ratio. After intense activity during the rainy season the rate slowed down in winter, mainly due to lack of moisture. No direct correlation existed between rate of decomposition of litter and any of the chemical constituents determined. However, the rate of decomposition is highest in species having maximum ash and N contents and lowest C/N ratio and lignin content. Lowest decomposition rates occurred in species which are relatively poor in ash and N content and highest in lignin content and C/N ratio. Generally 3-15 months are required for almost complete decomposition of litter. Litter most resistant to decay generally belonged to dominant species.--Ciopyright 1971, Biological Abstracts, Inc.
W72-00724

ECOPHYSIOLOGICAL INVESTIGATIONS ON LICHENS OF THE NEGEV DESERT: III. CO2 GAS EXCHANGE AND WATER RELATIONS OF CRUSTOSE AND FOLIOSE LICHENS IN THEIR NATURAL HABITAT DURING THE SUMMER DRY PERIOD (IN GERMAN),
Wuerzburg Univ. (West Germany). Botanisches Institut II.
Otto L. Lange, Ernst-Detlef, Schulze, and Werner Koch.
Flora Morphol Geobot Oekophysiol. 159 (6): 525-528. Illus. 1970. English summary.
Identifiers: Caloplaca-Aurantia-Var-Aurantia, Caloplaca-Ehrenbergii, Carbon, Crustose, Desert, Di, Diploschistes-Steppicus, Dry, Eco, Exchange, Foliose, Gas, Habitat, Israel, Lecanora-Farinosa, Lichens, Natural, Negev, Oxide, Period, Physiological, Relations, Squamarina-Cf-Crassa, Summer, Xanthoria-Isidioidea.

CO2 exchange and water relations of crustose and foliose lichens were examined under natural conditions at the end of the dry period in their highland habitat of the Central Negev Desert: Caloplaca ehrenbergii (Muell. Arg.) A. Zahlbr., C. aurantia (Pers.) Hellb. var. aurantia Poelt, Lecanora farinosa (Flk.) Nyl., Xanthoria isidioidea (Beltr.) Reichert et Galun, Squarmarina cf. crassa (Huds.) Poelt, Diploschistes steppious Reichert and endolithic lichens inside limestone. Similar to the behavior of the fruticose species Ramalina maciformis and Teloschistes lacunosus, the other life forms are also moistened sufficiently, as a result of nightly dew, so that an apparent photosynthetic CO2 uptake is possible for a period of several hours following sunrise. Maximum rates of photosynthesis are peak values compared with known values from field measurements of lichens from other climatic regions. They reach the order of the highest rates of CO2 assimilation of wild phanerogams, measured at the same time in the same habitat. The crustose and the foliose lichens are capable of absorbing enough water vapor in absence of dew condensation from the surrounding moist air at night to permit a short period of photosynthetic activity during the morning.--Copyright 1971, Biological Abstracts, Inc.
W72-00725

WATER- AND PHOTOSYNTHESIS-RELATIONS OF DESERT PLANTS IN THE MAURITANIAN SAHARA: I. RAINGREEN AND EVERGREEN TREES (IN GERMAN),
Technische Hochschule, Darmstadt (West Germany).
Otto Stocker.
Flora Morphol Geobot Oekophysiol. 159 (6): 539-572. Illus. 1970. English summary.
Identifiers: Acacia-Raddiana-D, Boscia-Senegalensis-D, Desert, Evergreen, Mauritanian, Photosynthesis, Plants, Raingreen, Relations, Sahara, Salvadora-Persica-D, Trees.

In the Mauritanian thorn-savanna (Sahel) and desert (Sahara) the water- and photosynthetic relationships of Acacia raddiana, as a representative of the raingreen (drought-deciduous) tree-type, and of Salvadora persica and Boscia senegalensis, as representative of the evergreen tree type, were examined. Daily variations in transpiration and photosynthesis in the natural stands were measured. In the Sahel, Acacia has a high water turnover, and a very productive photosynthetic rate during the rainy season. At the end of the dry season, the young leaves, which appear before the 1st rains, suffer from the insufficient water. Transpiration and photosynthesis are lowered and unstable. The 2 evergreen types demonstrate a different behavior: in the end of the dry season, in the Sahel Salvadora is forced to reduce transpiration and photosynthesis in a similar manner as Acacia, while in the Sahara Boscia is able to maintain a high rate and stability of both functions. This is due to locally higher amounts of soil water, effected by the accumulation of the runoff of heavy precipitation in wadis and their catchment areas. On this basis, in the Southern Sahara a contracted vegetation originates, composed of tree types, which the tropical savanna offers in a rich assortment. To the Northern Sahara, on the contrary, the northern steppe cannot support tree forms. Provided that the soil contains a sufficient amount of water, the evergreen type remains under extremely arid conditions.--Copyright 1971, Biological Abstracts, Inc.
W72-00726

TENTATIVE EXPLANATION OF DWARFISH GROWTH OF PLANTS ON SERPENTINE SOILS: I. PHYSICOCHEMICAL AND BIOLOGICAL PROPERTIES, AND MINERAL ELEMENTS OF SERPENTINE SOILS (IN POLISH),
Wroclaw Univ. (Poland). Dept. of Plant Physiology.
For primary bibliographic entry see Field 02G.
W72-00727

VEGETATION OF THE LOCATION 'POTIEVKA' OF THE BLACK SEA STATE RESERVATION (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
H. I. Bilyk, and V. S. Tkachenko.
Ukr Bot Zh. 27 (4): 491-496. Map. 1970. English summary.
Identifiers: Black, Grass-M, Irrigation, Location, Potievka, Reservation, Sea, Soils, Steppe, USSR, Vegetation, Wormwood-D.

The wormwood-grass desert steppe communities occur on solonetz and solonchak soils. It is expected that the removal of large quantities of water from the Krasnoz namenskaya irrigation system will modify the vegetation in the future.--Copyright 1971, Biological Abstracts, Inc.
W72-00729

EPHEMERAL PLANTS OF THE FLOODPLAIN ZONE OF THE RIVER BANKS IN THE LOWER COURSE OF AMUR, (IN RUSSIAN),
Khabarovsk State Pedagogical Inst. (USSR).
A. P. Nechaev, and Z. I. Gapeka.
Bot Zh 55 (8): 1127-1137. Illus. 1970. (English summary).
Identifiers: Amur, Banks, Ephemeral, Floodplain, Plants, River, USSR, Zone.

The floristics, ecology and distribution of floodplain ephemerals is discussed. Obligate and facultative ephemerals are distinguished. With the improvement of drainage many ephemerals will disappear from the Amur floodplain.--Copyright 1971, Biological Abstracts, Inc.
W72-00731

RESEARCH ON THE ECOLOGICAL REQUIREMENTS OF PICEA ABIES SEEDLINGS, (IN ITALIAN),
Florence Univ. (Italy). Istituto di Selvicoltura (I).
Pietro Piussi.
G Bot Ital. 104 (3): 193-214. Illus. 1970. (English summary).

Identifiers: Ecological, Germination, Growth, Irrigation, Mineral, Norway, Organic, Picea-Abies-G, Seedlings, Shade, Soil, Spruce-G.

In order to understand better the germination and 1st year growth of Norway spruce, we laid down during 1966 an experimental seeding in the nursery of Paneveggio (Trento) using 5 different soils, 3 levels of light, and 2 levels of moisture. Germination was faster on mineral than on organic soils, and was enhanced by irrigation (especially on organic soils) and by shading. The number of seedlings at the end of the 1st growing season was higher in irrigated plots; irrigation having a stronger influence in combination with reduced shade or organic soils. Dry weight of plants increased with increasing light and moisture. More solar radiation increased soil evaporation. The stem weight/root weight ratio, inversely proportional to available light, was highest on organic soils and lowest on mineral soils. Seedling height was enhanced both by irrigation and shading. The increased height was a sign of light deficiency. Organic soils are the least favorable to the spruce seedlings, while mineral soils are those most favorable, since these seedlings of spruce seedlings can be explained mainly by differences of available water in the various soils.--Copyright 1971, Biological Abstracts, Inc.
W72-00732

FEEDING OF RAINBOW TROUT (SALMO GAIRDNERI) IN RELATION TO ABUNDANCE OF DRIFTING INVERTEBRATES IN A MOUNTAIN STREAM,
Bureau of Sport Fisheries and Wildlife, Sierra Nevada Aquatic Research Lab.
T. M. Jenkins, Jr., C. R. Feldmeth, and G. V. Elliott.
J Fish Res Bd Can. 27 (12): 2356-2361. Illus. 1970.
Identifiers: Abundance, Drifting, Feeding, Insects, Invertebrates, Mountain, Rainbow, Relation, Salmo-Gairdneri, Seasonal, Stream, Trout.

Hatchery-reared rainbow trout, deprived of food for 48 or 96 hr and released in a mountain stream for 5- or 10-hr periods, consumed aerial invertebrates in numbers loosely associated with their seasonal and hourly abundance in the drift. The same was generally true for benthic insects, except that on several days feeding was much poorer relative to drift from 3:00 am to 8:00 am than at other times of day. In Sept. and Oct. tests, aerial forms were abundant during daylight, and benthic forms abundant at night, enabling trout to feed 24 hr a day. Day and night feeding in Sept. were roughly equal in importance, but in Oct. more food was taken during the day. Aerial invertebrates were so rare in Dec. that benthic insects were the most important prey day and night. However, even-benthics were not numerous enough to provide good feeding.--Copyright 1971, Biological Abstracts, Inc.
W72-00738

THE FEEDING AND FOOD INTERRELATIONS OF SOME INTERRELATIONS OF SOME COMMERCIAL FISH OF THE WATERS OF THE LOWER REACHES OF THE ZARAFSHAN RIVER, (IN RUSSIAN),
V. I. Istamova.
Nauch Tr Bukhar Gos Pedagog Inst. 19.5. 293-308. 1968.
Identifiers: Barbel, Carp, Commercial, Dace, Feeding, Fish, Food, Goldfish, Interrelations, Reaches, River, Shemaia, USSR, Vegetation, Zarafshan.

Thirteen spp. of fish are found in Lake Tuda-Kul'. They can be divided into 4 groups by their feeding: benthophagic, phytophagic, planktophagic, and predaceous. Observations show that the food of the fishes of this lake is somewhat different from the known spectrum of feeding of these species of fish. The principal fish foods are present in the lake in adequate quantities, but there is probably no planktophagic fish. Zooplankton are eaten principally by the young of the fish of the carp family, and for this reason the adult planktophagic fish resort to a predaceous way of life. The vegetation is richly developed in the lake, so that favorable conditions are present for the principal commercial fishwild and domestic carp, and barbel, and introduced fish in the lake, white amur and silver carp. A study of the feeding interrelations in the lake shows that competitors of the wild carp are goldfish, shemaia, and Zeravshan dace; those of the goldfish are wild carp and shemaia.--Copyright 1971, Biological Abstracts, Inc.
W72-00743

SPAWNING OF THE ROACH, BREAM, AND WILD CARP IN THE LOWER REACHES OF THE VOLGA RIVER FROM 1963 TO 1968, (IN RUSSIAN),
N. K. Timofeeva.
Tr Mol Uch Vses Nauch-Issled Inst Morsk Tyb Khoz Okeanogr. 1. 193-202. 1969.
Identifiers: Bream, Carp, Reaches, River, Roach, Spawning, USSR, Volga.

The regulated flow of the Volga has changed the conditions under which the roach, bream, and wild carp reproduce. The spawning of these fishes in the upstream portion of the delta more frequently begins at the same time as the formation of floodponds, and not thereafter. Their spawning in the mouth of the delta occurs before it does in the upstream part of the delta; smaller fish spawn on the fields more than in the mouth of the delta. Allowing small amounts of water to pass down the river and its quick fall leads to a condition in which the young of the wild carp, bream, and roach cannot grow up and migrate down the river. In years with high, prolonged flooding (1963, 1966 and 1968), the yield of roach, bream, and wild carp remained high even when the flow of the river was regulated.--Copyright 1971, Biological Abstracts, Inc.
W72-00744

THE DIET OF THE GRENADIER MACRURUS RUPESTRIS IN SOME AREAS OF THE NORTHWEST ATLANTIC AND IN ICELANDIC WATERS, (IN RUSSIAN),
S. G. Podrazhanskaya.
Tr Mol Uch Vses Nauch-Issled Inst Morsk Ryb Khoz Okeanogr. 1. 54-73, 1969.
Identifiers: Atlantic, Copepods, Diet, Grenadier, Icelandic, Invertebrates, Macrurus-Ruprestris, Northwest, Themisto.

This information was collected in 1967. The stomach contents of the grenadier showed a large number of species of organisms, but the principal food had only a few species. The most widespread item in the diet at all the locations was Themisto, copepods and euphausiids. Invertebrates had the largest number of species in the food of the grenadier. Analyses were made of the stomach contents taken at depths of 301-500, 501-700 and 701-850 m. In the northwestern Atlantic they prefer a depth of 501-700 m.--Copyright 1971, Biological Abstracts, Inc.
W72-00746

STUDIES ON THE RELATIONSHIP BETWEEN CARBON DIOXIDE GAS EXCHANGE AND THE AIR PASSAGES IN THE CAM-SUCCULENT PLANTS BRYOPHYLLUM DAIGREMONTIANUM BERG. AND AGAVE AMERICANA L. (UNTERSUCHUNGEN UBER DEN ZUSAMMENHANG ZWISCHEN DEM C O2-GASWECHSEL UND DER LUFTWEGIGKEIT AN DEN CAM--SUKKULENTEN BRYOPHYLLUM DAIGREMONTIANUM BERG. UND AGAVE AMERICANA L.),
Staatsinstitut fuer Experimentelle Botanik, Hamburg (West Germany).
U. Kristen.
Flora, Vol 160, No 1, p 127-138, 1969. 7 fig, 15 ref.

Descriptors: *Plant physiology, *Carbon dioxide, *Leaves, *Temperature, *Light, Xerophytes, Metabolism, Laboratory tests, Diurnal, Stomata, Circulation (Plants), Environmental effects.

Both Bryophyllum and Agave are crassulacean acid metabolism (CAM) plants, in which the diurnal course of leaf air passage and carbon dioxide gas exchange are controlled by temperature changes and alternation of light and dark periods. In continuous darkness, Bryophyllum leaves cease to take up carbon dioxide after about 17 hours, while uptake does not cease in Agave until about 27 hours. It appears that, unlike Bryophyllum, dropping and rising temperatures have no affect on carbon dioxide assimilation in Agave. In all other respects, carbon dioxide exchange and air passage take parallel courses. This close relationship must be based on increase and decrease in malate reserves. Carbon dioxide tension in the tissues must regulate stomatal opening. (Casey-Arizona)
W72-00757

AN EVALUATION OF TWO METHODS FOR OBTAINING LEAF TRANSMISSIVITY FROM LEAF REFLECTIVITY MEASUREMENTS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Climatology and Meteorology.
For primary bibliographic entry see Field 02D.
W72-00882

A COMPARATIVE STUDY OF RAINFALL INTERCEPTION BY GROUND LITTER IN A HARDWOOD, A RED PINE, AND A MIXED CONIFEROUS STAND,
Maine Univ., Orono. Dept. of Forest Resources.
P. R. Martin.
University of Maine, Graduate School, Master of Science Thesis, August 1971. 92 p, 23 fig, 21 tab, 26 ref. OWRR A-012-ME (1).

Descriptors: *Moisture content, *Hardwood, *Red pine trees, *Mixed forests, *Coniferous trees, Rainfall, Interception, Laboratory tests, Rainfall simulators, Saturation, Rainfall intensity, Field capacity.

Litter moisture changes from June to September 1970 amounted to 15.4 percent in the hardwood stand, 15.2 percent in the red pinestand, and 16.4 percent in the mixed coniferous stand of the 9.65 inches of gross rainfall in an open area. Litter interception is accurately predicted by using gross rainfall with initial weight of litter before precipitation. Short term laboratory tests, conducted with a rainfall simulator showed that hardwood litter became saturated at 1/2 inch intensity, and red pine and mixed litter reached saturation at 1 inch intensity. Significant differences were found in both field and laboratory studies of moisture holding capacities of litter for 3 litter samples. Abundant figures and tables show procedures and results. (Popkin-Arizona)
W72-00890

ECO-PHYSIOLOGICAL STUDIES ON PLANTS IN ARID AND SEMI-ARID REGIONS IN WESTERN AUSTRALIA V. HEAT RESISTANCE LIMITS OF PHOTOSYNTHETIC ORGANS OF DIFFERENT SEASONS, THEIR RELATION TO WATER DEFICITS AND CELL SAP PROPERTIES AND THE REGENERATION ABILITY,
Western Australia Univ., Nedlands. Dept. of Botany.
E. O. Hellmuth.
Journal of Ecology, Vol 59, No 2, p 365-374, July 1971. 1 fig, 4 tab, 19 ref.

Descriptors: *Physiological ecology, Heat resistance, *Water balance, *Chemical properties, *Xerophytes, Leaves, Plant physiology, Osmotic pressure, Conductivity, Heat exchange, Arid lands, Temperature, Metabolism.
Identifiers: *Plant cell sap, *Regenerative ability, *Australia.

Using a new method for determining heat resistances in dry air, seasonal changes were ob-

served in the heat resistance limits of mature photosynthetic organs of 6 xerophytes. In order to determine whether seasonal changes in heat resistance limit are more closely correlated with the changes in plant water balance or with chemical changes in the cell sap, the products of water content and cell sap properties, conductivity, the refractometer value and osmotic potential were examined. It was concluded that the osmotically active substances in the cell sap and not the prevailing water conditions were more closely correlated with seasonal changes in heat resistance limits. Chemical change in the cell sap was mainly due to the ion fraction in 4 species, the molecularly dispersed fraction in 1 species and both fractions in 1 species. In all species, tissue temperatures were well below the heat resistance limit and regeneration ability was high. (Casey-Arizona)
W72-00892

SPATIAL DISTRIBUTION AND SUCCESSIONAL STATE OF GRASSLAND VEGETATION RELATED TO GRAZING INTENSITY TREATMENTS,
Wyoming Univ., Laramie. Plant Science Div.
G. C. Mitchell.
Master of Science Thesis, June 1971. 64 p, 7 tab, 8 fig, 49 ref. OWRR A-001-WYO (37).

Descriptors: *Plant growth regulators, Grazing, Grasslands, Treatment, Spatial distribution, Plant populations, Vegetation, Ecological distribution, Distribution patterns, Frequency analysis, Sampling, Grasses, Succession, Rhizomes, Plant morphology, Seeds, Soil moisture, Soil-water-plant relationships, Wyoming, Arid lands.
Identifiers: *International Biological Program.

This International Biological Program study determined plant pattern characteristics on 5 semi-arid areas in Wyoming, 3 grazed at light, medium and heavy intensities, and 2 protected from grazing for 10 and 30 years. Analysis of frequency varance by transects was used to determine pattern scale and intensity of blue grama, needleleaf sedge, plains prickly pear and scarlet globe mallow. The 4 species were nonrandomly distributed. Sampled areas were in differing stages of secondary succession due to grazing pressure. All species except seeding globe mallow propagated by means of rhizomes. Plains prickly pear exhibited small scale pattern attributed to plant morphology. Medium scale patterns were created by differing grazing intensities. Large scale patterns could not be attributed to grazing. Intensity of pattern values for each species was independent of pattern scale or plant abundance. Rhizomatous species decreased as sites approached a climax condition, except on the 10-year enclosure where blue grama abounded. Seeding globe mallow showed no trend due to successional state. Soil-moisture parameters are sketched. (Popkin-Arizona)
W72-00898

2J. Erosion and Sedimentation

COMPUTERIZED SLOPE STABILITY; SLIP SURFACE DEFINED BY A POLYNOMIAL OF ANY DEGREE,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
A. Mohan.
Internal Report No 11, June 1971. 51 p, 4 fig, 1 tab, append.

Descriptors: *Slope stability, *Erosion control, *Soil stabilization, *Systems analysis, *Computer programs, Input-output analysis, Soil properties, Slopes, Geomorphology, Soil water movement, Surfaces, Hydrologic data, Mathematical studies, Rainfall-runoff relationships.
Identifiers: *Slip surfaces.

A modified computer program is capable of handling slip surfaces defined by a polynomial equation of any reasonable degree. The possible uses of the program include the following: (1) Any analytical function can be input, either exactly or approximately, for calculation of the factor of safety, and compared with any other analytical function. An exhaustive comparison requires a searching technique for any function. (2) Reduction of a graphically represented irregular surface to the form of a fitting polynomial, making possible quantitative comparisons among such surfaces. (3) Typical irregular failure surfaces can be represented by the fitted polynomial, after which, the function may be used in a systematic search for the position of minimal factor of safety. This increase in maximum definition points for an irregular surface from 12 to 25 permits examination of a highly irregular surface. (Woodard-USGS)
W72-00594

SAMPLE USES OF COMPUTERIZED SLOPE STABILITY SOLUTIONS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
P. V. Raczynski.
Internal Report No 8, January 1971. 29 p, 17 fig. OWRR A-009-IND (2).

Descriptors: *Slope stability, *Erosion control, *Soil stabilization, *Systems analysis, *Computer programs, Input-output analysis, Seepage, Water table, Hydrologic data, Soil properties, Rainfall-runoff relationships, Slopes, Geomorphology, Soil water movement.

Computer programs were used to generate solutions for specific slope configurations. A secondary part of the project was the application of a finite element solution to a seepage domain, to produce improved input for stability programs. Four different slopes were selected for analysis to illustrate various analytical options, as well as to show the variations produced by different assumptions. The computer programs include: Slope 1. slope stability by the Taylor solution, Slope 2. slope stability by the modified Bishop solution, Slope 3. slope stability by an adaption of the modified Bishop solution (taking moments at y—infinity), and Slope 4. slope stability by an irregular slip-surface analysis. All four Slope programs are relatively efficient and fast. The procedure and results for each analyzed slope are presented separately. (Woodard-USGS).
W72-00595

A PRELIMINARY INVESTIGATION OF SUSPENDED-SAND DISCHARGE OF THE RUSSIAN RIVER, SONOMA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02L.
W72-00601

CHARACTERISTICS OF ERODED SOILS IN THE RIGHT-BANK FOREST STEPPE IN THE UKRAINIAN SSR, (IN UKRAINIAN),
B. T. Kabachenko.
Zemlerobstvo Respub Mizhvidom Temat Nauk Zb. 15. 60-68. 1968. Russian summary.
Identifiers: Acidity, Bank, Bases, Composition, Distribution, Eroded, Exchange, Forest, Humus, Nutrient, Soils, Steppe, Ukrainian-SSR, USSR.

Eroded soils cover large areas in the right-bank Ukraine, the reduced content of clay particles in the arable layer being a common feature of all the eroded soils. The eroded soils differ markedly from non-eroded ones in distribution and composition of humus. Deep non-eroded chernozems contain 4.11% humus in their arable layer, as against 2.51% in medium eroded and 2.06% in strongly eroded chernozems. There were changes in the contents of exchange bases and acidity. The erosion of soil brought the carbonates nearer the surface, and consequently the reaction of soil solution in the arable horizon became weakly acid or neutral (pH 6.5-7.0). Eroded soils had appreciably lower contents of available nutrients.--Copyright 971, Biological Abstracts, Inc.
W72-00671

SURFACE RUNOFF AND SOIL EROSION ON EXPERIMENTAL CATCHMENTS, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-00673

AGROCHEMICAL AND BIOLOGICAL FEATURES OF ERODED SOILS, (IN UKRAINIAN),
S. S. Brakin, and P. T. Chelyadnyk.
Zemlerobstvo Respub Mizhvid Temat Nauk Zb. 15. 115-126. 1968. Russian summary.
Identifiers: Erosion, Soil.

Soil erosion mapping by the method of topographic profiles (water divide-bottoms of gullies and valleys), and the techniques for establishing boundaries of soil sites on slopes are described. The mapping of contemporary linear erosion forms and the use of combined schematic maps of outwash and erosion of soil are included. Several indexes are suggested for erosion assessments.--Copyright 1971, Biological Abstracts, Inc.
W72-00677

EFFECT OF LATE PLEISTOCENE KARST TOPOGRAPHY ON HOLOCENE SEDIMENTATION AND BIOTA, LOWER FLORIDA KEYS,
Indiana Univ., Bloomington. Dept. of Geology.
J. Robert Dodd, and Charles T. Siemers.
Geol Soc Amer Bull. 82 (1: 211-218. Illus. Maps. 1971.
Identifiers: Avicennia-Nitida-D, Biota, Black, Buried, Florida, Holes, Holocene, Karst, Keys, Mangrove-D, Pattern, Pleistocene, Red, Rhizophora-Mangle-D, Sedimentation, Sink, Thalassia, Testudinum-M, Topography, Turtle-Grass-M, Vegetation.

Detailed mapping of bedrock topography on Bahia Honda and Big Pine Keys has revealed a buried karst topography not previously documented in the lower Florida Keys. This topography, developed during lowered sea level of the Pleistocene, strongly controls Holocene sediment thickness and present biotic distribution. Circular to oval sinkholes, which are up to 75 m or more in diameter and over 4 m deep, are usually completely filled with peat and carbonate sediment. Sinkholes are well developed on both the Miami Limestone (oolitic facies) and the Key Largo Limestone (both late Pleistocene in age). Thick sediment in buried sinkholes in more than a few inches of water favors the growth of thick patches of turtle grass (Thalassia testudinum). Shallower water and supratidally located sinkholes (that is, those partly or wholly surrounded by subaerially exposed bedrock) are generally marked by thick growths of either red or black mangroves (Rhizophora mangle and Avicennia nitida). These distinct, nearly circular vegetation patterns are extremely abundant in the study area, as shown by aerial photographs which suggest that Bahia Honda and Big Pine Keys are 'riddled' with sinkholes.--Copyright 1971, Biological Abstracts, Inc.
W72-00717

SEDIMENTARY STRUCTURES IN THE LOWER GREENSAND OF THE WEALD, ENGLAND, AND BAS-BOULONNAIS, FRANCE,
Smith (V. Zay) Associates Ltd., Calgary (Alberta).
J. Narayan.
Sedimentary Geology, Vol 6, No 2, p 73-109, September 1971. 12 fig, 3 tab, 37 ref.

Descriptors: *Sedimentation, *Sand waves, *Paleohydrology, *Sedimentary structures, *Stratigraphy, Beaches, Waves (Water), Currents (Water), Ripple marks, Deposition (Sediments), Sands, Sediment transport.
Identifiers: Paleocurrent analysis.

The cross-stratification and other sedimentary structures in the Lower Greensand of the Weald, England, and Bas-Boulonnais, France, are the

result of lateral migration of sand waves in a neritic sea. If those sediments were deposited as a result of tidal current similar to the present-day North Sea, then the Lower Greensand shoreline was oriented northwest-southeast, and the western part of the London Platform was submerged. (Knapp-USGS)
W72-00759

STUDIES ON SEDIMENT MOVEMENT AT THE ENTRANCE OF A TIDAL RIVER,
Calcutta Port Commissioners (India). Hydraulic Study Dept.
For primary bibliographic entry see Field 02L.
W72-00760

DOWNCURRENT DECLINE OF GRAIN SIZE AND THICKNESS OF SINGLE TURBIDITE BEDS: A SEMI-QUANTITATIVE ANALYSIS,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
A. E. Scheidegger, and P. E. Potter.
Sedimentology, Vol 17, No 1-2, p 41-49, September 1971. 2 fig, 16 ref, append.

Descriptors: *Turbidity currents, *Sedimentation, *Deposition (Sediments), *Stratigraphy, Sediment transport, Turbulence, Turbulent flow, Suspended load, Particle size, Model studies, Sedimentary structures, Currents (Water).
Identifiers: *Turbidites.

Turbidite sequences become thinner bedded and finer grained as they are traced downcurrent. A semi-quantitative explanation of this behavior is based on the idea that turbulence in a turbidity current decays downcurrent so that in its zone of deposition both the total load in suspension and the grain size of that load decrease with increasing distance from the source. The model relating bed thickness to distance can be supported by observational evidence. The thickness of interbedded shales increased downcurrent and some individual beds thin in the Cretaceous Bavarian flysch. (Knapp-USGS)
W72-00761

ANTIDUNE CROSS-STRATIFICATION IN A TURBIDITE SEQUENCE, CLORIDORME FORMATION, GASPE, QUEBEC,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
K. Skipper.
Sedimentology, Vol 17, No 1-2, p 51-68, September 1971. 9 fig, 39 ref.

Descriptors: *Sedimentary structures, *Turbidity currents, *Paleohydrology, *Sediment transport, *Sedimentation, Stratigraphy, Dunes, Ripple marks, Channel morphology, Particle size, Hydraulics, Settling velocity, Suspended load.
Identifiers: Cloridorme Formation (Quebec).

Single-set cross-stratification, considered to have been produced by the upstream migration of antidunes, is present in the basal division of some thick turbidite beds of the Cloridorme Formation, Quebec. The basal divisions of these turbidites consist of very coarse to medium sand with a smooth or fluted base and sinusoid top. Internal laminae are inclined upstream at a shallow angle (less than 15 deg), opposing the local paleocurrent direction shown by flutes and ripple-drift cross-lamination. The sinusoid (antidune) bed forms and their associated internal cross-strata were preserved by the rapid fall-out of sediment from suspension normal to the bed. A paleohydraulic analysis suggests that during the final stages of antidune growth and migration, the currents moved at approx. 1 m/sec over very low slopes (much less than 1 deg). (Knapp-USGS)
W72-00762

DIFFERENT SOURCES CONTRIBUTING TO A BEACH SAND, SOUTHEASTERN BORNHOLM (DENMARK),
Ruhr Univ. Bochum (West Germany). Dept. of Geology.
H. Fuchtbauer, and J. M. Elrod.
Sedimentology, Vol 17, No 1-2, p 69-79, September 1971. 5 fig, 1 tab, 8 ref.

Descriptors: *Beaches, *Sands, *Mineralogy, *Provenance, *Tracking techniques, Particle shape, Particle size, Sediment transport, Sampling, Tracers, Sedimentation.
Identifiers: *Bornholm (Denmark).

An abnormal relationship between quartz roundness and grain size, unusual K-feldspar accumulation in the medium sand fraction, quartz grains with overgrowths, and a differentiated heavy-mineral community made it possible to calculate the contributions of four sources to a modern beach sand in southeastern Bornholm, Denmark. The quartz grains with overgrowths were particularly sensitive to transport and clearly showed an increase in roundness away from their origin, the Balka Quartzite. This rock, due to its high resistance, contributed only about 1% to the beach sands. (Knapp-USGS)
W72-00763

CONTROL OF SLOPE ON DEPOSITION FROM SMALL-SCALE TURBIDITY CURRENTS: EXPERIMENTAL RESULTS AND POSSIBLE GEOLOGICAL SIGNIFICANCE,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.
J. P. B. Lovell.
Sedimentology, Vol 17, No 1-2, p 81-88, September 1971. 4 fig, 2 tab, 14 ref.

Descriptors: *Sedimentation, *Turbidity currents, *Deposition (Sediments), Slopes, Suspended load, Particle size, Stratigraphy, Hydraulic models, Model studies, Flumes, Sands, Silts.

Deposition by turbidity currents was studied using a small trough inside a larger flume. The experiments involved pouring aqueous suspensions of pumice sand and kaolinite silt into the submerged trough. The steepness of the bottom slope of the trough was varied from run to run. Heights of sand and silt were recorded at 10-cm intervals away from source. The ratio of sandstone to shale is a sensitive indicator of proximality in ancient turbidites. The rate of decrease in that ratio away from source is not strongly related to steepness of bottom slope. The rate of decrease in sandstone thickness away from source in ancient turbidites may be inversely proportional to steepness of bottom slope. (Knapp-USGS)
W72-00764

AN APPLICATION OF REFLECTED-LIGHT DIFFERENTIAL INTERFERENCE MICROSCOPY: BEACH STUDIES IN EASTERN LONG ISLAND (U.S.A.),
Florida State Univ., Tallahassee. Dept. of Oceanography.
D. A. Warnke, and D. K. Stauble.
Sedimentology, Vol 17, No 1-2, p 103-114, September 1971. 7 fig, 1 tab, 18 ref.

Descriptors: *Microscopy, *Sands, *Sediments, *Erosion, *Provenance, Sediment transport, Beaches, Optical properties.
Identifiers: Interference microscopy.

Differential-interference contrast (DIC) optics can be used in the study of mineral-grain surfaces. For this purpose, conventional replicas of the grains are placed on petrographic slides which in turn are placed over a silvered mirror on the microscope stage. The optical system is then adjusted until the best contrast is achieved. Samples were collected from the intertidal zone of the Atlantic shore of eastern Long Island. An attempt was made to quantify the areal extent, on each quartz grain, of large breakage features such as produced by glacial or colian action. Each grain was counted as belonging to one of four arbitrarily established categories: 0-25%, 26-50%, 51-75%, and 75-100% of grain surface covered by identifiable large breakage features. A general increase was found in the percentage of grains with less than 50% area covered by large mechanical features from the Hamptons toward Montauk Point. Conversely, the percentage of grains whose area is more than 50% covered, decreases in the same direction. Comparison of samples from the Hampton localities with samples from Montauk Point gives an impression of increasing importance of beach features going from west to east. (Knapp-USGS)
W72-00765

MICROTEXTURES OF PARTICLES FROM SOME EUROPEAN LOESS DEPOSITS,
Wroclaw Univ. (Poland). Inst. of Geography.
J. Cegla, T. Buckley, and I. J. Smalley.
Sedimentology, Vol 17, No 1-2, p 129-134, September 1971. 4 fig, 9 ref.

Descriptors: *Electron microscopy, *Loess, *Weathering, *Particle shape, Sediments, Diagenesis, Particle size.
Identifiers: *Scanning electron microscopes.

Examination of loess particles with the scanning electron microscope (SEM) allows several previously unresolvable features to be distinguished. SEM observations confirm that the majority of loess particles are angular but reveal a distinct proportion of rounded particles. Most particles have very fine particulate material adhering to their surfaces and virtually all show signs of surface attack to a greater or lesser degree. Contrary to some published statements it appears that European loess particles tend to show signs of weathering. (Knapp-USGS)
W72-00766

THE DISTRIBUTION OF PENNSYLVANIAN--AGE COAL PARTICLES IN RECENT RIVER SEDIMENTS, OHIO RIVER, KENTUCKY, AS AGE AND SEDIMENT RATE INDICATORS,
Kentucky Univ., Lexington.
Bruce R. Moore.

Descriptors: *Sedimentation, *Tracers, *Ohio River, *Coals, *Sedimentation rates, Kentucky, Sediment transport, Erosion, Scour, Soil erosion, Accelerated erosion, Alluvium, Alluvial channels.

The weight percentage of coal particles in the Ohio River alluvium increases suddenly toward the upper levels of the river sediments. This increase is attributed to the onset of coal washing and mining operations in approximately the last 150 years. The distribution of these coal particles facilitates recognition of recent sediments less than this age. The coal distribution also gives indications of sedimentation rates and regions of scour and deposition on the river banks and islands. The maximum rate of sedimentation found at the downstream end of an island was 114 cm/150 years, the equivalent of 450 cm of pore-free sediment in 1,000 years. (Knapp-USGS)
W72-00767

VARIATIONS IN THE NUTRIENT CONTENT OF SUSPENDED SEDIMENTS IN RIVERS OF CENTRAL ASIA AND SOUTHERN KAZAKHSTAN (NEKOTORYYE ZAKONOMERNOSTI SODERZHANIYA PITATEL'NYKH ELEMENTOV VO VZVESHENNYKH NANOSAKH SREDNEAZIATSKIKH I YUZHNOKAZAKHSTANSKIKH REK),
Akademiya Nauk SSR, Moscow. Institut Geografii.
N. T. Kuznetsov, and I. A. Klyukanova.
Pochvovedeniye, No 1, p 134-138, January 1971. 3 tab, 8 ref.

Descriptors: *Sediments, *Suspended load, *Nutrients, *Rivers, Humus, Nitrogen,

Phosphorus, Potassium, Calcium, Irrigation, Irrigation water, Chemical analysis.
Identifiers: *USSR, Central Asia, Kazakhstan, Suspended sediments.

The suspended sediments in rivers of Central Asia and Southern Kazakhstan are noted for their highly varying content of humus, nitrogen, mobile phosphorus, and mobile potassium. The sediments are relatively rich in humus, total and mobile potassium, and are poor in nitrogen and mobile phosphorus. Suspended sediments which contain larger amounts of humus, nitrogen, and mobile phosphorus are often relatively poor in mobile potassium. A study of the chemical composition of these sediments will lead to a more thorough understanding of the nature of the changes which take place in soils as a result of irrigation. (Josefson-USGS)
W72-00808

RARE-EARTH ELEMENTS IN BLACK SEA SEDIMENTS (REDKOZEMEL'NYYE ELEMENTY V OSADKAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
L. S. Fomina, and I. I. Volkov.
Litologiya i Poleznyye Iskopayemyye, No 2, p 148-160, March-April 1970. 4 fig, 5 tab, 16 ref.

Descriptors: *Sedimentation, *Sediments, *Geochemistry, *Trace elements, Sea water, Mud, Diagenesis, Iron, Manganese, Oxides, Calcium carbonate.
Identifiers: *USSR, *Black Sea, *Rare earths, *Rare-earth oxides, *Concretions, Sapropel, Yttrium, Lanthanum, Cerium, Praseodymium.

The composition of total rare earths in the surface layer of Black Sea sediments and the distribution of rare earths in Black Sea iron-manganese concretions were examined to determine their geochemical behavior in the diagenesis of present-day marine sediments. The rare-earth content of the surface layer of sediments was determined at 19 stations distributed over the whole area of the Black Sea. The sediments consisted mainly of reduced argillaceous and calcareous-argillaceous gray muds. The total content of rare-earth oxides in the surface layer of sediments was 0.004-0.019%. The rare-earth and CaCO3 contents of the sediments were inversely proportional, inferring a close relationship between the rare earths and the argillaceous terrigenous minerals of the sediments. Iron-manganese concretions of the Black Sea did not concentrate rare earths, and the rare-earth composition differed from that of the adjoining mud. The mean rare-earth oxide concentration for the concretions was 0.005%. (Josefson-USGS)
W72-00813

HORIZONTAL AND VERTICAL DISTRIBUTION OF MICROPARTICLES IN THE 1965 LAYER BETWEEN BYRD STATION AND THE WHITMORE MOUNTAINS, ANTARCTICA,
Ohio State Univ., Columbus, Ohio. Inst. of Polar Studies.
For primary bibliographic entry see Field 02C.
W72-00822

THE QUESTION OF THE ORIGIN OF THE MAGNETIC SPHERULES FOUND IN ANTARCTIC ICE,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
For primary bibliographic entry see Field 02C.
W72-00823

CHEMISTRY OF ANTARCTIC ICE: IMPLICATIONS ON THE RATE OF ACCRETION OF EXTRA-TERRESTRIAL MATTER,
Brussels Univ. (Belgium). Dept. of Nuclear Geology and Geochemistry.
For primary bibliographic entry see Field 02C.
W72-00824

THREE-DIMENSIONAL STABILITY ANALYSIS OF OPEN CHANNEL FLOW OVER AN ERODIBLE BED,
Technical Univ. of Denmark, Copenhagen. Hydraulic Lab.
F. Engelund, and J. Fredsoe.
Nordic Hydrology, Vol 2, No 2, p 93-108, 1971. 7 fig, 7 ref.

Descriptors: *Sediment transport, *Bed load, *Suspended load, *Regime, *Alluvial channels, Channel morphology, Sand waves, Dunes, Ripple marks, Turbulent flow, Roughness (Hydraulic), Reynolds number, Scour, Erosion, Sedimentation, Mathematical models.

The formation of ripples and dunes (lower range bed waves) is related to the transport of sediment as bed load. The formation of the upper range bed configurations (standing waves, antidunes) may be explained on the assumption that the predominant part of the sediment transport is in suspension. A mathematical model of the formation of double-periodic antidunes uses first-order potential flow theory. It differs from previous models in taking account of the nonuniform distribution of the suspended load. The theory predicts regions of stability and instability. (Knapp-USGS)
W72-00835

CHARACTERISTICS OF THE BRAIDED STREAM DEPOSITIONAL ENVIRONMENT WITH EXAMPLES FROM THE SOUTH CANADIAN RIVER, TEXAS,
New Mexico Univ., Albuquerque. Dept. of Geology.
L. G. Kessler, II.
Earth Science Bulletin, Vol 4, No 1, p 25-35, March 1971. 7 fig, 1 tab, 27 ref.

Descriptors: *Braiding, *Discharge (Water), *Deposition (Sediments), *Channel erosion, *Vegetation effects, Texas, Semiarid climates, River flow, Geomorphology, Floods, Channel morphology, Dunes, Bank erosion, Oklahoma, Alluvium, Flood plains.

The presence of vegetation retards erosion so that braided stream channels commonly occur only in arid and semiarid regions with extreme variation in sediment supply to fluvial channels. Since land plants did not become widespread before the Miocene, braided channels were the dominant continental fluvial type in pre-Cretaceous times. An understanding of braided channels is therefore necessary for interpretation of ancient continental rocks. The South Canadian River of the semiarid region of panhandle Texas and western Oklahoma exhibits several features important in recognition and understanding braided channel deposits. The river was investigated through field studies, aerial photograph analyses and daily discharge records. The air photos revealed at least 8 channel sequences of differing ages, representing formerly active braided channel systems. Initial analysis indicates that the river is braided because of excess sediments supplied to it from unstable banks, and that fluctuation in daily discharge rate is also a braiding factor. Daily discharge data from 1938-1966 indicates that while average flow is usually quite low, periodic floods in excess of 20,000 c.f.s. do occur and severly alter existing channel and floodplain morphology. (Casey-Arizona)
W72-00891

THE FLOODS IN THE WADI BARDAGUE IN 1968 (TIBESTI, REPUBLIC OF CHAD) (DIE UBERSCHWEMMUNGEN IN WADI BARDAGUE IM JAHR 1968 (TIBESTI, REP. DU TCHAD)),
Belgrade Univ. (Yugoslavia). Geographic Inst.
D. Gavrilovic.
Zeitschrift fur Geomorphologie, Vol 14, No 2, p 202-218, 1970. 8 fig, 5 tab, 22 ref.

Descriptors: *Geomorphology, *Stream erosion, *Arid lands, *Channel erosion, *Sediment transport, Sedimentary basins (Geological), Arroyos, River basins, Geologic time, Geologic investigations, Downstream, Sands, Gravels, Terraces (Geological), Terrain analysis, Mode of action, Rainfall, Climatic data, Floods.
Identifiers: *Downcutting, *Chad, Sahara Desert, *Inter-Tropical Convergence Zone.

Rainfall in the central Sahara is largely connected with the Inter-Tropic Convergence Zone, with summer monsoons from Guinear c..rrying moist air northward. The Tibesti Mountains of Chad are the border between monsoon precipitation and Mediterranean precipitation. In 1968, two floods occurred in the Wadi Bardague and this paper reports a study of their erosional effects. The first flood reached a depth of 1 m., a velocity of 2.5 m/sec and a discharge of 70 cbm/sec. The second floor reached a maximum river depth of 0.4 m. and a maximum discharge of 40 cbm/sec. Since no estuary exists, all material eroded in the upper course of the river must be deposited in the lower course. Stones placed in the upper course before the floods showed that they are not powerful enough to move much more than finer sediments. Measurement of marks dug into the bottom of the valley at the Oasis Bardai showed that at present, fine accumulation of sand and sideward erosion are in progress. By contrast, terrace sediments in the valley consist mainly of coarse gravels. This suggests that wetter periods must have existed in past. During arid periods, rocks crumbling, mainly of clastic materials, occurs, and the finer products are carried downstream by the occasional floods. During fluvial periods, a greater amount of alluvial material is carried downstream, and is eventually followed by a downcutting of the river bed. (Casey-Arizona)
W72-00895

2K. Chemical Processes

THEORETICAL EVIDENCE AGAINST THE EXISTENCE OF POLYWATER,
Princeton Univ., N.J. Dept. of Chemistry.
For primary bibliographic entry see Field 01A.
W72-00574

CHEMISTRY OF NATURAL WATERS -- IV. SATURATION PH VALUE,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
P. H. Kemp.
Water Research, Vol 5, No 9, p 735-740, September 1971. 10 ref.

Descriptors: *Water chemistry, *Natural streams, *Hydrogen ion concentration, *Saturation, *Water treatment, Calcium carbonate, Chemical reactions, Corrosion, Corrosion control, Mathematical studies, Analytical techniques.

The saturation pH value (pHs) of a water is defined as the pH value that results when, by addition or removal of carbonic acid but by no other chemical change, the water is brought into equilibrium with solid calcium carbonate. The stability of natural waters towards calcium carbonate can be rigidly treated by the principles employed throughout this series of papers and leads to a slightly different expression for the pHs than obtained by more familiar but less accurate methods. The relevance of pHs corrosivity is discussed and some comments made on pHs correction during water treatment. A scale-forming water (pH greater than pHs) can be treated by dosing with mineral acid (to lower the pH and raise the pHs) or by gassing with carbon dioxide (to lower the pH without affecting the pHs) in order to obtain the desired value of the saturation index. A scale-forming water (pH less than pHs) can be treated by adding a base (to raise pH and lower pHs) and the most effective additive will be lime (calcium hydroxide) since this has a double action on the pHs in that it simultaneously increases both the alkalinity and calcium content. (Woodard-USGS)
W72-00576

A PHOSPHATE SORPTION INDEX FOR SOILS,
Macaulay Inst. for Soil Research, Aberdeen (Scotland). Dept. of Soil Fertility.
For primary bibliographic entry see Field 02G.
W72-00579

THERMODYNAMICS OF SINGLY CHARGED ION EXCHANGES IN THE TRACE REGIONS ON CAMP BERTEAU MONTMORILLONITE,
Louvain Univ. (Belgium) Inst. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-00582

PROLONGED LEACHING OF ORTHIC BLACK AH MATERIAL WITH WATER AND AQUEOUS EXTRACTS OF POPULUS TREMULOIDES AND P. BALSAMIFERA LEAVES,
Department of Agriculture, Lethbridge, (Alberta). Research Station.
For primary bibliographic entry see Field 02G.
W72-00583

CHEMICAL QUALITY OF GROUND WATER IN THE DOS PALOS-KETTLEMAN CITY AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-00600

GROUND-WATER HYDROLOGY OF THE SAN PITCH RIVER DRAINAGE BASIN, SANPETE COUNTY, UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 02F.
W72-00603

GRAVEL AND SAND AQUIFER IN THE BASSANO-GEN REGION, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 02F.
W72-00608

EFFECT OF NITROGEN, ZINC, COPPER AND MANGANESE ON YIELD AND CHEMICAL COMPOSITION OF IRRIGATED WINTER WHEAT IN IRAN,
College of Agriculture. Pahlavi Univ., Shiraz (Iran).
For primary bibliographic entry see Field 03F.
W72-00691

GASES ENTRAPPED IN ICE: A PRELIMINARY REPORT ON THE STUDY OF TWO VERTICAL PROFILES IN TERRE ADELIE, ANTARCTICA,
Centre National de la Recherche Scientifique, Boulogne (France).
For primary bibliographic entry see Field 02C.
W72-00770

OXYGEN ISOTOPE ANALYSIS OF A CORE REPRESENTING A COMPLETE VERTICAL PROFILE OF A POLAR ICE SHEET,
Copenhagen Univ. (Denmark). Physics Lab (II).
For primary bibliographic entry see Field 02C.
W72-00771

WATER RESOURCES DATA FOR LOUISIANA: PART 1, SURFACE WATER RECORDS: PART 2, WATER QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 07C.
W72-00794

POLARIZING MICROSCOPE IDENTIFIES WATER-FORMED DEPOSITS,
Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05A.
W72-00828

LIQUID SCINTILLATION COUNTING OF CA-45 IN GEOCHEMICAL STUDIES,
Alaska Univ., College. Inst. of Marine Science.
G. D. Sharma, and R. J. Barsdate.
Chemical Geology, Vol 8, No 1, p 33-36, July 1971. 2 tab, 6 ref. Contract AT (04-3)-310-PA4.

Descriptors: *Radioactivity techniques, *Calcium, *Tracers, Geochemistry, Analytical techniques, Instrumentation, Tracking techniques, Water chemistry, Ion exchange, Crystallization, Clay minerals, Mineralogy.
Identifiers: *Calcium radioisotopes.

A simplified method for the use of radioactive calcium in experimental geochemistry accommodates aqueous samples from 1.0 to 3.5 ml with high and constant efficiency (50%). Solutions containing sea water, HCl, and organic complexing agent have been assayed for Ca-45 with a precision of plus or minus 3% for one standard deviation. The use of a gelling agent in the two-phase emulsion liquid-scintillation method reduced self-absorption and sample-preparation problems usually associated with the counting of aqueous samples of beta emitters such as Ca 45. (Knapp-USGS)
W72-00830

COOPERATIVE INVESTIGATIONS--II. KNOWLEDGE OF SURFACE WATER QUALITY IMPORTANT TO WATER DEVELOPMENT BOARD,
Texas State Water Development Board, Austin.
For primary bibliographic entry see Field 05A.
W72-00881

2L. Estuaries

HYDRODYNAMICAL STUDIES ON THE ST. LAWRENCE RIVER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02E.
W72-00590

A PRELIMINARY INVESTIGATION OF SUSPENDED-SAND DISCHARGE OF THE RUSSIAN RIVER, SONOMA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
W. M. Brown, III.
Geological Survey Open-file Report, March 17, 1971. 11 p, 5 fig, 3 tab, 4 ref.

Descriptors: *Sediment transport, *Estuaries, *Sedimentation, *Coasts, *California, Data collections, Dredging, Sands, Particle size, Surveys.
Identifiers: *Russian River (Sonoma County Calif).

The Russian River (Sonoma County, California) is investigated in its function of discharging sediments which enter the littoral zone as potential beach-forming material. A commercial dredging operation is being designed to remove salable sand and gravel from a reach of the river beginning at its mouth and extending possibly 5 miles upstream. Because this dredging will influence the existing equilibrium between river and littoral sand transport, it is necessary to evaluate this equilibrium to ensure that the dredging does not cause an adverse imbalance in the sediment budget of the littoral zone. The suspended-sand discharge of the river to its esturial reach was estimated at 510,000 tons per year, or about 380,000 cubic yards per year, for a 5-year period beginning October 1, 1964. (Woodard-USGS)
W72-00601

THE SAGUENAY FJORD: THE ICHTHYOLOGICAL FAUNA AND THE ECOLOGICAL CONDITIONS, (IN FRENCH),
Joliette Coll. (Quebec).
Gerard Drainville.
Natur Can. 97 (6): 623-666. Illus. 1970. English summary.
Identifiers: Atylus-Carinatus, Canada, Ecological, Fauna, Fjord, Gammaracanthus-Loricatus, Ichthyological, Lycodes-Pallidus, Nereis-Zonata, New, Ophiopus, Arcticus, Record, Relicts, Saguenay, Sympleustes-Pulchella, Tryphosa-Spitzbergensis.

The ichthyological fauna of the Saguenay fjord comprises 50 spp. divided into 21 families. One particular arctic species, Lycodes pallidus, is new in the region of the Estuary and of the Gulf of St. Lawrence. A correlation is being established here between the zoogeographical categories (arctic, low-arctic, arctic-boreal, boreal) to which those species belong and the characteristics of the water layers they inhabit in the Saguenay. The conclusion of our study is that the Saguenay fjord is formed of 2 ecological and superposed milieux and that its lower water layer constitutes a biogeographical arctic enclave within a boreal zone. That latter point is indicated by the great number of arctic and low-arctic species of fish that are found there, together with an abundance of many invertebrates, actually rare in or absent from the Estuary or the Gulf of St. Lawrence and confined to the polar seas: Ophiopus arcticus, Nereis zonata, Sympleustes pulchella, Tryphosa spitzbergensis, etc. An analogy may be noted between the zoogeographical arctic reserve of the fjord and the phytogeographical arctic enclave of the Shickshock Mountains of Gaspe Peninsula. Moreover the abundant harvest of 2 spp. of coastal amphipods, Gammaracanthus loricatus and Atylus carinatus, typical of the arctic sea coasts, not found in the Estuary and the Gulf of St. Lawrence and recognized as relicts of some European regions, indicates that some elements of the Saguenay fauna are in fact characterized as such relicts of some European regions, indicates that some elements of the Saguenay found are in fact characterized as such relicts. The Saguenay fjord may thus be designated as a kind of ecological memory of the Arctic in a boreal zone.--Copyright 1971, Biological Abstracts, Inc.
W72-00695

RELATION BETWEEN BIOMASS, PRODUCTIVITY, AND LOSS TO PREDATORS IN A POPULATION OF A MARINE BENTHIC POLYCHAETE, PECTINARIA HYPERBOREA,
Bedford Inst., Dartmouth (Nova Scotia).
D. L. Peer.
J Fish Res Bd Can. 27 (12): 2143-2153. Illus. Map. 1970.
Identifiers: Benthic, Biomass, Distribution, Loss, Marine, Pectinaria-Hyperborea, Polychaete, Population, Predators, Productivity.

The changes in population density and individual size distribution in a population of the trumpet worm P. hyperborea Malmgren were observed on 8 occasions in 20 mo. at a station 60 m deep on a soft muddy substrate in St. Margaret's Bay, Nova Scotia. Production proceeded rapidly during the early life stages while loss due to mortality (elimination) was low, so that biomass increased and reached a maximum at 170 days. Between 30 and 370 days the rate of elimination was nearly constant at about 0.9 g/sq m wet weight per 50-day period in spite of changing biomass. After 370 days the rate of production, rate of elimination, and biomass decreased. It was estimated that 80% of mortality was due to predation. Almost 90% of total production of the cohort took place in the 1st yr of life. The ratio between annual production and biomass present in May 1967 in the study area was used to estimate annual production at 24 stations in the bay.--Copyright 1971, Biological Abstracts, Inc.
W72-00698

THE OCCURRENCE OF LEPTODORA KINDTII (FOCKE) (CLADOCERA) IN VIRGINIA TRIBUTARIES OF CHESAPEAKE BAY,
Army Engineer District, Jacksonville, Fla.
James R. Chambers, Richard G. Burbidge, and W. V. Van Engel.

Chesapeake Sci. 11 (4): 255-258. Map. 1970.
Identifiers: Bay, Chesapeake, Cladocera, Leptodora-Kindtii, Peaks, Seasonal, Tributaries, Virginia.

The occurrence of L. kindtii in Virginia tributaries of Chesapeake Bay was determined from plankton collections made in the York-Pamunkey system during 1965-1967 and the York, Rappahannock and Potomac rivers and some of their tributaries during 1967-1968. Leptodora was found as early as 13 April and as late as 16 Sept., at temperatures from 9.6 to 30 C, and salinities from 5.84% o/oo) to fresh water (A0.5 (o/oo). It was taken a maximum of 11 mi. below fresh water; specimens in brackish water were apparently strays from upriver. Estimates of numbers of Leptodora in the Pamunkey River indicated a population peak in May. Males 1st appeared on 19 May in the Mattaponi River, and there was an increase in percentage of males from 19 May to 22 June. The largest specimen was an 11-mm female collected in the Potomac River.--Copyright 1971, Biological Abstracts, Inc.
W72-00700

HYDROLOGY OF THE YTHAN ESTUARY WITH REFERENCE TO DISTRIBUTION OF MAJOR NUTRIENTS AND DETRITUS,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
J. H. Leach.
J Mar Biol Ass U K. 51 (1): 137-157. Illus. Map. 1971.
Identifiers: Carbon, Chlorophyll, Detritus, Distribution, Estuary, Factor, Hydrology, Nutrients, Ratios, Salinity, Scotland, Tide, Ythan.

The Ythan estuary, a short shallow estuary in north-eastern Scotland, was surveyed over a 2-yr period to determine environmental characteristics and distribution of nutrients and organic C. The tide is the dominant environmental factor. Ratio of tidal prism volume to freshwater volume at mean high water is about 20:1. Flow ratios indicate that the estuary is well mixed. Flushing time for mean tides was calculated as 1.15 tidal periods. The horizontal salinity gradient varied seasonally and with tidal amplitude. Seasonal variations were related to rainfall and evaporation. Channel salinities near the mouth ranged from 1.7% at low tide in spring to 34.2% at high tide in summer. Vertical stratification existed in the middle and upper reaches at high tide but was not observed at low water. Although mean temperatures were similar, the range at the head of the estuary was much wider than at the mouth. The horizontal gradient in nutrient concentration was related to tidal incursion. Freshwater levels of inorganic phosphate were slightly higher than marine concentrations: amounts of nitrate and silicate in the freshwater were about an order of magnitude greater than in marine water. Seasonal pattern of nutrients in the marine end of the estuary was related to the biological cycle in neritic waters of the North Sea. Seasonal distribution of nutrients in freshwater was related to rainfall and the seasonal application of fertilizers to agricultural land in the drainage area. Freshwater supplies about 70% of the nitrate and 80% of the silicate which flows into the estuary; marine water contributes about 70% of the phosphate. Seasonal distribution of particulate C was not directly related to biological processes. On a seasonal basis, highest to lowest levels C occurred in the order of autumn, winter, spring, summer. Carbon-to-chlorophyll ratios indicated that 65-95% of the particulate organic matter flowing into the estuary with sea water was detritus. In freshwater the amount of particulate C was closely correlated with rainfall, which indicated that most of the organic matter entering the estuary with freshwater was detritus of terrestrial origin. The marine contribution to particulate C exceeded that of freshwater by an order of magnitude.--Copyright 1971, Biological Abstracts, Inc.
W72-00711

ALTERATION OF VEGETATION IN HJARBAEK FJORD 1967-1969 (IN DANNISH),
P. Uhd Jepsen.
Flora Fauna. 76 (3): 99-108. Illus. Maps. 1970. English summary.
Identifiers: Alteration, Dam, Denmark, Eelgrass-M, Elodea-Canadensis-M, Fjord, Heleocharis-Palustris-M, Hjarbaek, Phragmites-Communis-M, Pondweed-M, Potamogeton-Pectinatus-M, Reed-M, Ruppia-Maritima-M, Rush-M, Salinity, Scirpus-Lacustris-M, Scirpus-Maritimus-M, Spike, Spirogyra, Tassel, Vegetation, Water-Thyme-M, Zostera-Marina-M.

Hjarbaek Fjord (56 deg 32 min N; 09 deg 14 min E) is a part of the southern Limfjord connected with Lovns Bredning by a narrow strait, Virksund. In 1966 Virksund was closed with a dam. Before the dam was established the average surface-salinity in the N part of the inlet was 14-19%oo and in the E part between 7-13%oo. afterwards the salinity of the water fell. Large areas in the inlet are very shallow, i.e. from 0-2 m. Here the bottom mainly consists of sand or sand mixed with clay. The bottom conditions and the vegetation cover were described. After the closing of Virksund the composition of the vegetation changed. Eelgrass (Zostera marine) was very common in the northern part of the inlet before 1966, but the species was not registered in 1967. Tassel pondweed (Ruppia maritima) was common in the eastern part of the inlet in 1967, but in 1969 it was growing exclusively along the W banks. Since 1967 pondweed (Potamogeton pectinatus) has spread a bit in the E part and in the cove near Kvols. Since 1967 water thyme (Elodea canadensis) has also spread, especially in the mouths of the brooks and in great areas in the eastern part. Green algae, Chlorophyceae (mainly Spirogyra) have spread concurrently with Elodea, and mostly in the same area. Along the banks of Hjarbaek Fjord smaller reed beds, which mainly consist of common reed (Phragmites communis), club-rush (Scirpus maritimus and S. lacustris) and spike rush (Heleocharis palustris) are found, mainly around the mouths of the brooks.--Copyright 1971, Biological Abstracts, Inc.
W72-00728

THE BENTHIC ALGAL COMMUNITIES OF FLATS AND SALT MARSHES IN THE GREVELINGEN, A SEA-ARM IN THE SOUTH--WESTERN NETHERLANDS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
P. H. Nienhuis.
Neth J Sea Res. 5 (1): 20-49. Illus. 1970.
Identifiers: Algal, Benthic, Blidingia-Minima, Bostrychia-Scorpioides, Cladophora, Communities, Cyanophyta, Enteromorpha-Spp, Flats, Fucus-Vesiculosus, Grevelingen, Halophytes, Marshes, Netherlands, Salt, Sea-Arm, Southwestern Spartina-Townsendii-M, Ulothrix, Ulva-Spp, Vaucheria-Spp.

The communities of sand and mud flats and salt marshes were studied during 3 yr. A survey of the most prominent environmental factors was given. The algal vegetation was divided into 2 categories (A and B); in both several algal communities could be distinguished on the base of a phytosociological analysis of a number of sample plots and many additional data. The vegetation on shoals, sand and mud flats in the sublittoral region and the lower part of the eulittoral region: (A 1) Enteromorpha prolifera-E. linza sociation on fine-grained sand; (A 2) microvegetation in and on shells of molluscs and barnacles; (A 3) Enteromorpha-Cladophora community in sea-grass meadows; (A 4) Ulva rigida and U. lactuca-Fucus vesiculosus f. mytili sociation on mussel-banks. The vegetation on flats and salt marshes in the upper part of the eulittoral region and the supra-littoral region: (B 5) Fucus vesiculosus f. volubilis sociation on the lower parts of the marshes, especially among Spartina townsendii; (B 6) Bostrychia scorpioides sociation in rather dense stands of halophytes; (B 7)Vaucheria thuretti-V. sphaerospora sociation on creek banks (B 8) Blidingia minima sociation, an epiphytic community; (B 9) vernal Ulothrix sociation; (B 10) communities dominated by Cyanophyceae; (B 11) general Chlorophyceae community where the genera Rhizoclonium, Enteromorpha and Vaucheria are conspicuous; (B 12) vegetation in salt-marsh pools. Some notes on the ecology of the genus Enteromorpha were attached. The pattern of the most conspicuous habitats in the Grevelingen was indicated and a map showing these habitats was given. The validity of the nomenclatural concept of Chapman for salt-marsh algal communities, and the relation between the associations of halophytes and the algal communities were discussed. A complete list of species was given.--Copyright 1971, Biological Abstracts, Inc.
W72-00730

OUTLINE OF MACROPHYTIC VEGETATION OF LESINA AND VARANO LAGOONS, (IN ITALIAN),
Bologna Univ. (Italy). Inst. of Botany.
Francesco Corbetta.
G Bot Ital. 104 (3): 165-191. Illus. Map. 1970. (English summary).
Identifiers: Italy, Juncus-Acutus-M, Kochia-D, Lagoons, Lamprothamnion-Papulosum, Lesina, Macrophytic, Outlines, Phragmites-Communis-M, Potamogeton-Pectinatus-M, Ruppia-Maritima-M, Salicornia-D, Salsola-D, Scirpus-Maritima-M, Varano, Vegetation, Zostera-Marina-M.

Some observations on the vegetation of Lesina and Varano lagoons, in Puglia, are reported. The presence of well represented associations as Zosteretum marinae, Ruppietum maritimae, Scirpetum maritimi, Phragmitetum communis, Salicornietum fruticosae, Suaedo-Kochietum hirsutae, Salicornietum herbaceae, Salsoletum sodae, of a new subassociation, Suaedo-Kochietum hirsutae salicornietosum herbaceae subassoc. nova, and of some consociations of Lamprothamnion papulosum, Potamogeton pectinatus, and Juncus acutus was ascertained. A diffuse phytogeographical description of these ambients and a schematic synthesis of the individuated types of vegetation are given.--Copyright 1971, Biological Abstracts, Inc.
W72-00734

GROWTH IN LENGTH OF EASTERN SUCKERS, CATOSTOMUS CATOSTOMUS (FORSTER), FROM SAGUENAY, (IN FRENCH),
Montreal Univ., Quebec (Canada).
Louis-Marie Lalancette, and Etienne Magnin.
Natur Can. 97 (6): 667-677. Illus. Map. 1970. (English summary).
Identifiers: Canada, Catostomus-Catostomus, Growth, Length, Saguenay, Scale, Suckers.

The 889 specimens used in this study were taken from the upper part of the Saguenay fjord. The determination of the age of each specimen was arrived at after studying the scale. The growth in length of the young is rapid and similar among the female and male specimens. However, the growth rate of the adults is somewhat lower. The female, however, is always approximately 10 mm longer in length as compared to the male in the same age group. The female specimens live longer than the male specimens. Whether the salt concentration in the Saguenay River had any effect on the growth of the eastern longnose sucker, was not established.--Copyright 1971, Biological Abstracts, Inc.
W72-00735

CHLORINATED HYDROCARBON INSECTICIDE RESIDUES IN WINTER FLOUNDER, PSEUDOPLEURONECTES AMERICANUS, FROM THE WEWEANTIC RIVER ESTUARY, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Forest and Wild Life Management.
For primary bibliographic entry see Field 05B.
W72-00737

STUDIES ON SEDIMENT MOVEMENT AT THE ENTRANCE OF A TIDAL RIVER,
Calcutta Port Commissioners (India). Hydraulic Study Dept.
A. K. Chakrabarti.
Sedimentary Geology, Vol 6, No 2, p 111-127, September 1971. 7 fig, 11 ref.

Descriptors: *Sediment transport, *Rivers, *Estuaries, Tides, Currents (Water), Statistical methods, Particle size, Sediment load, Deltas, Dredging, Sedimentation.
Identifiers: Rupnarain River (India).

Sediment properties and their transport above the entrance of the River Rupnarain, India, were investigated by the use of statistical parameters of grain size of sediments which were transported after dumping of dredged material at the entrance of the river. During the dry season, the River Rupnarain maintains general upstream movement of sediments at its entrance. A very small amount of the sediment load accumulated in the mouth of the northern channel and the rest moves in the southern channel. During freshets, the net sediment movement is seawards and whatever materials enter the northern channel during flood are mostly washed back by the eff. (Knapp-USGS)
W72-00760

RECONNAISSANCE OF SEA-WATER INTRUSION ALONG COASTAL WASHINGTON, 1966--68,
Geological Survey Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-00789

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10.
W72-00805

MAINTENANCE OF A FUNCTIONAL ENVIRONMENT IN THE LOWER PORTION OF THE HUDSON RIVER ESTUARY: AN APPRAISAL OF THE ESTUARY,
Boyce Thompson Inst. for Plant Research, Inc., Yonkers, N. Y.
Edward H. Buckley.
Contributions from Boyce Thompson Institute, Vol 24, p 387-396, 1971. 11 ref.

Descriptors: *Estuaries, *Hudson River, *Waste assimilation capacity, Tidal effects, Nutrients, Cycling nutrients, Urbanization, Marshes, Water pollution effects, Municipal wastes, Submerged plants, Food chains, Anadromous fish, Ecology, Fish management, Water pollution treatment, Nonstructural alternatives, Cities, New York.
Identifiers: *New York City, Toxic effects, Nutrient trap, Biological support systems, Troy (N.Y.).

The functions of biological, physical, and chemical parameters of the Hudson River estuary that operate to make it a multi-billion dollar waste conversion system for the megalopolis which extends northward from the river mouth are evaluated. Consequences of restricting marshes and shallows by railroad embankments and accelerated rates of filling and dredging operations, removal of submerged aquatic plants, removel of toxicants that can and can not be detoxified by biological systems, and transition of raw sewage to secondary treated sewage, thermal discharges, and oxygen depletion, are described. Maintenance of the present oxygen balance is viewed with cautious optimism if no further physical changes are made. The ecological approach should be to evaluate the biology as a necessary support system for the megalopolis and as a system to maintain marine resources, to provide recreation, aesthetic values, and to reduce pollution of the ocean. The size of the megalopolis should be dictated by the quantity of support systems required. Planned deescalation of certain cities is preferable to the stresses of economic realities when inefficiencies of size make the unit noncompetitive. (Auen-Wisconsin)
W72-00844

CLEAN WATER FOR FLORIDA'S ESTUARIES.
For primary bibliographic entry see Field 05G.
W72-01000

THE OIL INDUSTRY AND MULTIPLE USE OF THE COASTAL MARGIN,
Fulbright, Crooker, Freeman, Bates, and Jaworski, Houston, Tex.
For primary bibliographic entry see Field 05G.
W72-01012

CLEAN WATER FOR PUERTO RICO'S ESTUARIES.
For primary bibliographic entry see Field 05G.
W72-01058

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SALINE WATER CONVERSION REPORT FOR 1970-1971,
Office of Saline Water, Washington, D.C.
J. W. Heintz, W. F. Savage, W. S. Gillam, J. L. Strobel, and J. J. Powell, Jr.
Copy alailable from GPO, Washington, DC 20402--$5.75. Office of Saline Water Report, 1971. 580 p, 477 fig, 147 tab, 43 ref, 3 append.

Descriptors: *Desalination, *Demineralization, *Separation techniques, *Desalination plants, Reviews, Saline water, Desalination apparatus, Desalination processes, Water chemistry, Costs, Programs, Project planning.

A progress report of saline water conversion in the United States for 1970-71 is presented. The review includes five main sections by different authors: Section 1. Project Management and Plant Engineering, by J. W. Heintz; Section 2. Engineering and Development, by W. F. Savage; Section 3. Research, by W. S. Gillam; Section 4. Desalting Feasibility and Economic Studies, by J. J. Strobel; and Section 5. Program Analysis and Program-Planning Budgeting System, by J. L. Powell, Jr. Since the desalination program began in 1952, the Office of Saline Water and the desalting industry have discovered and advanced techniques that can convert large amounts of saline water into a pure product at reasonable cost. The costs per 1,000 gallons, for example, have been reduced in actual production plants from about $4.00 to as low as a reported 65 cents for desalting seawater and as low as a reported 35 cents for converting brackish waters of less mineral content. (Woodard-USGS)
W72-00612

ANNUAL REPORT (FY1968) FREEPORT TEST FACILITY AND VERTICAL-TUBE-EVAPORATOR TEST-BED PLANT, FREEPORT, TEXAS.
Stearns-Roger Corp., Denver, Colo.

Available from U. S. Government Printing Office, Washington, D.C. 20402, Price $3.75. Office of Saline Water Research and Development Progress Report No 479, September 1969. 293 p, 56 tab, 32 fig, 7 ref. OSW Contract 14-01-001-1713.

Descriptors: *Sea water, Long-tube vertical distillation, Saline water, Distillation, Boiling, Deaeration, Heat exchangers, Heat transfer, Centrifugal pumps, Evaporators, *Desalination, Condensation, Operation and maintenance.
Identifiers: Heat transmission, Heat recovery, Falling-film evaporation.

This report presents a wide variety of information, findings, and recommendations concerning the multiple-effect falling-film-evaporation method of desalination. Most of the data included are derived from the development studies. Not only are the technical, logistical, and economical evaluations for Fiscal Year 1968 operations presented herein, but also the process and mechanical development program results are related to the VTE process in particular, and desalination in general. Actual capital and operating costs are presented and compared to the oretical 'normalized' capital and operating costs. Production and maintenance cost averages are presented; relevant operating and maintenance experiences are discussed. A thorough technical evaluation of the performance of the existing process (including the 5-effect module), the mechanical equipment, and the construction materials is included in this report. The process evaluation is elaborated to include presently defined limitations of the temperatures and concentration ratios for scale-free operation of VTE evaporators without presoftening the feed water. An evaluation of certain process equipment has been made and is included. Operations of the Auxiliary Test Unit are analyzed and discussed. The results of tests with newly installed equipment of advanced design are also presented. (Dykstra-OSW)
W72-00613

ANNUAL REPORT (FY 1968) VAPOR COMPRESSION TEST BED PLANT ROSWELL, NEW MEXICO.
Westinghouse Electric Corp., Orange, Calif. Water Province Dept.

Available from U. S. Government Printing Office, Washington, D.C. 20402, Price $1.25. Office of Saline Water Research and Development Report No 421, September 1968. 145 p, 22 tab, 31 fig. OSW Contract 14-01-0001-1742.

Descriptors: *Brackish water, Long-tube vertical distillation, Heat exchangers, Heat transfer, *Distillation, Pumps, Evaporators, Deaeration, *Desalination, Operation and maintenance.
Identifiers: *Vapor compression distillation.

This Fifth Annual Report of the Roswell Plant presents the results obtained from operation maintenance and development studies. The process is a double-effect, rising film, evaporation process with heat input via a vapor compressor. The site has been expanded to include an auxiliary test unit (evaporator), membrane pilot plants, a pilot scale feed water treatment system, and a laboratory. The operation of the vapor compression plant during fiscal 1968 was plagued by problems with the vapor compressor speed increase and motor. The problems culminated with a destructive failure of the compressor. The seed slurry method has been used only for short run periods, but has demonstrated success in prevention of scale formation. Modifications of the seed recovery system have been required to make the system operable.
W72-00614

SIXTH ANNUAL REPORT FREEPORT TEST FACILITY, FREEPORT, TEXAS.
Stearns-Roger Corp., Denver, Colo.

Available from U. S. Government Printing Office, Washington, D.C. 20402, Price $1.75. Office of Saline Water Research and Development Progress Report No 440, October 1969. 144 p, 9 tab, 12 fig. OSW Contract 14-01-001-218.

Descriptors: *Sea water, Long-tube vertical distillation, Saline water, Distillation, Boiling, Deaeration, Heat exchangers, Heat transfer, Centrifugal pumps, Evaporators, *Desalination, Condensation, Operation and maintenance.
Identifiers: Heat transmission, Heat recovery, Falling-film evaporation.

This report presents a wide variety of information findings and recommendations concerning the Multiple-Effect VTE evaporation method of desalination. The included data are derived from the results obtained from operation, maintenance, and development studies. Not only are the technical, logistical, and economical evaluations for Fiscal Year 1967 operations presented herein, but also the process and mechanical development program results as related to the process in particular, and desalination in general. Actual capital and operating costs are presented and compared to theoretical 'normalized' capital and operating costs. Production, cost averages, and maintenance problems are also presented. Technical evaluations of the existing process, installed equipment, corrosion analyses, and construction materials is included in this Report. The process evaluation is elaborated to include presently defined limitations of the temperatures and concentration ratios for scale-free operation of VTE evaporators without pre-softening the sea water feed. An evaluation of certain process equipment has been made and is included, particularly diameter variations for falling film tubes. Results of tests with newly installed advanced design equipment, and the more accurate results stemming from use of high-accuracy instrumentation are tabulated and evaluated. A process description, flow diagram, and economic summary of the 17-Effect Plant is presented as well as illustrations and descriptions of the actual modification work. (Dykstra-OSW)
W72-00615

REVERSE OSMOSIS PERMEATORS - A DESIGN STUDY,H. W. MCROBBIE, AND
Union Carbide Corp., Tarrytown, N.Y.
H. W. McRobbie, and L. M. Litz.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 423, May 1969. 42 p, 10 fig, append. OSW Contract 14-01-0001-1293.

Descriptors: *Reverse osmosis, *Membrane processes, *Osmosis, *Desalination processes, *Desalination apparatus, Separation techniques, Design, Pilot plants.

A nominal 1,000 gpd high pressure reverse osmosis pilot plant was constructed and tested to demonstrate the feasibility of achieving a high membrane packing density by housing a stack of flat-plate membranes within a cylindrical pressure vessel. A sandwich type construction was used on the individual membrane elements with an outer cellulose acetate membrane sheath internally supported by a wet strength paper and 50 mesh screen. The high pressure brine is on the shell-side, flowing longitudinally along the membrane leaves. A screen member is interposed between leaves to provide uniform spacing in the brine channel and facilitate mixing. In the initial proof test, target performance was achieved (22 gfd flux, 94% rejection at 900 psi on 0.1% NaCl at 80% recovery and 100F). Design details for the pilot unit are presented. (Witmer-OSW)
W72-00616

DEVELOPMENT OF THE DIRECT CONTACT CONDENSATION MULTISTAGE FLASH PROCESS PHASE IIIA,
Atomics International, Canoga Park, Calif.
A. L. Kohl, W. B. Suratt, S. Westerman, and T. T. Shimazaki.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $1.00. Office of Saline Water Research and Development Progress Report No 647, January 1971. 52 p, 13 fig, 10 tab, 4 ref. OSW Contract 14-01-0001-2266.

Descriptors: *Desalination, *Distillation, *Condensation, Films, Pilot plants, Saline water, *Flash distillation.
Identifiers: Direct contact condensation, Plastic film analysis.

The over-all objectives of this program is to develop the Atomics International Direct Contact Condensation Multistage Flash (AI DCC-MSF) Distillation Process for Saline Water Conversion. The primary objectives of the phase covered by this report (Phase IIIA) were to procure extended operation performance data on lap welded Tedlar tubes in the plastic film heat exchanger (PFHE) test unit; conduct hydraulic studies of condensate flow in support of the pilot plant design; and design a pilot plant which will demonstrate all basic features of the process, provide design data for larger plants, and serve as a test bed for proposed process improvements. A secondary objective was to continue the development of plastics for PFHE use. (Robinson-OSW)
W72-00617

Brookhaven National Lab., Upton, N.Y. 06Design Studies on Multistage Flash Distillation Vessels,
P. Bezler, J. M. Hendrie, K. C. Hoffman, A. Oltman, and M. Reich.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $1.00. Office of Saline Water Research and Development Progress Report No 687, July 1971. 89 p, 26 fig, 2 tab, 6 ref, append. OSW Contract 14-01-0001-2208.

Descriptors: *Distillation, *Flash distillation, *Concretes, Concrete construction, Concrete technology, Design.
Identifiers: Concrete-polymer materials, Computer stress codes, *Vessel designs, Finite element method.

A preliminary survey of vessels for multistage flash distillation units using concrete-polymer as a material of construction was undertaken. This material is made by the impregnation of concrete with a monomer that is subsequently polymerized and has improved mechanical properties as well as increased resistance to hot brine and distillates. The design basis vessel was a horizontal cylinder with hemispherical heads, 30 ft i. d. x 90 ft straight length, having no penetrations, supported and having a stage wall baffle every 15 ft. Vessel designs for both a 50 and 15 psig operating pressure, all vessesl suitable for vacuum service, were evaluated. Standard reinforced construction, prestressed construction and concrete-polymer lined ordinary concrete in both prestressed and reinforced construction were analyzed in detail. Stress determinations were made through the use of two computer stress codes based on the finite element method. Stresses were evaluated at the design pressure and under vacuum, in the longitudinal direction and at a cross section containing a stage wall, for each vessel. Printouts of all the calculated results are provided. Successful vessel designs, as well as analysis limitations and areas for future study, are delineated and discussed. In the case of the 50 psig design basis vessel, the use of concrete-polymer material with prestressed construction permits a wall thickness of as little as 4 in.
W72-00618

HIGH RECOVERY OPTIMIZATION STUDY,
Envirogenics Co., El Monte, Calif.
S. T. Braunheim.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $1.50. Office of Saline Water Research and Development Progress Report No 684, June 1971. 178 p, 48 fig, 30 tab, 11 ref, 3 append. OSW Contract 14-01-0001-1835.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, *Brine disposal, Evaluation, Membrane processes, Osmosis, Optimization.

Four representative brackish waters were analyzed, in tubular reverse osmosis desalting plants of 10 million gallons per day capacity, to determine optimum product water recoveries (product to feed ratio). In most cases the optimum recovery was found to be greater than 90% and for all cases in excess of 80% even when brine disposal cost is ignored. A detailed cost model was developed incorporating all capital and operating costs associated with pretreatment, desalting and brine disposal. On the average the cost model showed that installed capital costs varied in a narrow range between $3.50 and $4.00 per square foot of membrane surface. The total cost of desalted water varied between 21 cents and 72 cents per 1,000 gallons for the four brackish waters studied depending significantly on feed water composition, remembraning cost, power cost and brine disposal cost. (Mattson-OSW)
W72-00619

PERFORMANCE TEST OF HIGH TEMPERATURE WATER JET COMPRESSOR OPERATING IN HIGH TEMPERATURE RANGE,
American Hydrotherm Corp., New York.
Lou Malfitani, and A. Frenzel.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 664, May 1971. 46 p, 23 fig. OSW Contract 14-01-0001-2165.

Descriptors: Desalination, *Distillation, *Vapor compression distillation, *Temperature, Laboratory tests, Cost comparisons.
Identifiers: *Water jet compressor.

This report describes tests made on a High Temperature Water Jet Vapor Compressor at high discharge vapor pressures (corresponding to 280F) to compare performance with that observed previously with lower discharge pressures (corresponding to 240F). The performance ratio (excess steam produced per unit of steam compressed per degree of temperature rise during compression) was 0.0238 when the HTW was at 1223 psia and 570F. This agrees with the performance of the low pressure jet with 1010 psia HTW. The mechanical efficiency was 32.4% with 1223 psia HTW, and 30.5% with 1010 psia HTW, compared with 33.8% achieved by the low pressure jet. The high pressure jet performed best with a 19F rise, and performed well up to 23F rise, indicating that the jet may be applied in multi-stage desalination systems with up to four stages. In application to desalination systems, the HTW jet requires only 40 Btu/lb. of product when operating with a 20F rise over four-effect evaporator with a 10.1 feed train. With a single-effect evaporator at 10F rise, the jet requires 61 Btu/lb product. In comparison with a gas-turbine vapor compression cycle with power generation, the HTW jet using the excess steam in a 11.1 MSF produced the same product ratio with the same fuel input, at 31.6 cents per 1000 gallons compared with 39 cents for the GT-VC cycle, due to a capital cost saving. (Robinson-OSW)
W72-00620

DEVELOPMENT OF FLOW WORK EXCHANGERS FOR ENERGY RECOVERY IN REVERSE OSMOSIS PLANTS,
Dynatech R and D Co., Cambridge, Mass.
Gerald B. Gilbert.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.75. Office of Saline Water, Research and Development Progress Report No 672, April 1971. 79 p, 7 tab, 27 fig. OSW Contract 14-01-0001-2213.

Descriptors: Desalination, *Reverse osmosis, *Pilot plants, Membrane processes, Osmosis.
Identifiers: Energy recovery, Power recovery, Flow exchangers.

The purpose of this work was to evaluate the performance of pilot plant flow work exchangers built under a previous development program, to design automatic control systems for such a work exchanger and to determine the general feasibility of recovering pumping energy with such systems. The report covers Phase I of the program and as such provides the necessary evaluation needed to support initiation of Phase II which will cover the design construction and field testing of a larger

flow work exchanger. Prior work was conducted by Kansas State University (OSW R and D Progress Report 357) and resulted in construction of pilot plant work exchangers of both the piston and bladder type with flow capacity of 9 to 18 gpm. These units were subsequently evaluated in the Phase I work at Dynatech. Recovery efficiencies of over 92% have been reported in the Phase I report and Phase II has been authorized. (Sieveka-OSW)
W72-00621

EXCHANGE DIFFUSION (DONNAN SOFTENING) AS A PRETREATMENT TO DESALINATION PROCESSES,
Process Research, Inc., Cambridge, Mass.
J. D. Smith.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.70. Office of Saline Water Research and Development Progress Report No 655, May 1971. 71 p, 22 tab, 26 fig. OSW Contract 14-01-0001-1782.

Descriptors: *Water softening, *Ion exchange, *Hardness (Water), *Cation exchange, Ion transport, Separation techniques, Diffusion, Membrane processes, Saline water, Sea water.
Identifiers: *Donnan equilibrium, Calcium exchange, Sulfate removal.

Exchange Diffusion, referred to also as 'Donnan Membrane Softening,' is a selective separation process based on the selective exclusion and transport properties of thin, flexible, ion-exchange membranes. It is a technique which exploits the Donnan exclusion properties of ion-exchange membranes to selectively remove bivalent hardness ions from feed waters to desalination processes. Such removal of scale forming calcium and/or magnesium ions enables the desalting plant to operate more efficiently and results in sufficient overall cost reductions not only to justify the expense and complexity of the additional treatment but to produce lower-cost water. The feasibilities of continuous recirculation of the regenerant solution during calcium/magnesium exchange from brackish waters, of sulfate removal as an alternative to softening and seawater softening were examined. A 2000 gpd prototype EXD unit for brackish water softening was designed and built and the initial test program for this pilot unit concluded. A spiral wound EXD module was also constructed and preliminary evaluation tests were conducted. (Kindley-OSW)
W72-00622

FIELD EVALUATION OF A RADIAL-FLOW ROUND STACK ELECTRODIALYSIS UNIT,
AMF, Inc., Stamford, Conn.
R. N. Smith, and R. A. Knight.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water, Research and Development Progress Report No 669, April 1971. 87 p, 19 fig, 9 tab. OSW Contract 14-01-0001-2212.

Descriptors: *Desalination, *Electrodialysis, *Membranes, Membrane processes, *Demineralization, Ion exchange, Efficiencies.
Identifiers: Radial flow.

A novel design electrodialysis stack having a circular cross section and utilizing process streams that flow on a radial pattern from the periphery of the stack toward its center, was field tested in Roswell, New Mexico on well water blends of 2000, 2500, and 3000 ppm TDS, respectively. The 3000 ppm water was successfully demineralized to 500 ppm TDS at a product water flux of 100 gallons per day per square foot of ion-exchange membrane and the 2000 ppm TDS water was similarly demineralized at a product water flux of 180 GFD. The current efficiencies were acceptably high, but the electrical energy requirements were 2 to 4 times those anticipated, even in view of the high product water flux. An analysis of the data showed that maldistribution of flow from cell to cell could account for the abnormally high electrical energy requirements. (Mintz-OSW)
W72-00623

DEVELOPMENT OF DIRECT CONTACT CONDENSATION MULTISTAGE FLASH DISTILLATION PROCESS - PHASE I,
Atomics International, Canoga Park, Calif.
A. L. Kohl, T. T. Shimazaki, J. R. Wetch, and L. L. Bienvenue.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.50. Office of Saline Water R and D Progress Report No 475, Sept 1969. 110 p, 37 fig, 14 ref. OSW Contract No 14-01-0001-1680.

Descriptors: *Condensers, *Turbulence, *Heat exchangers, *Flash distillation, *Plastics, Desalination processes.
Identifiers: Direct contact condensation multistage flash.

The feasibility of the Atomics International Direct Contact Condensation Multistage Flash (DCC-MSF) Distillation Process was investigated by the conduct of analytical and experimental studies on a direct contact condensation module and a plastic film heat exchanger. The studies indicated the process to be feasible. Direct contact condensation of steam onto the surface of water flowing in open channels was accomplished with heat transfer coefficients greater than 2000 Btu/hr/sq ft (1) by providing a high cross-flow steam velocity to disturb the water surface, and (2) by the use of simple vane type turbulence promotors in the water system. Long term strength, creep rate, and resistance to hot brine of PVF films were found to be adequate for its use in plastic film heat exchangers. A plastic film heat exchanger was designed, fabricated, tested, and operated. No operational problems were encountered. A technique was devised for fabricating lap welded, plastic film tubes. (Robinson-OSW)
W72-00624

DEVELOPMENT OF STORAGE TECHNIQUES FOR REVERSE OSMOSIS MEMBRANES,
Aerojet-General Corp., El Monte, Calif.
R. W. Lawrence, B. J. Mechalas, P. H. Allen, and R. R. Jay.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water, Research and Development Progress Report No 673, April 1971. 86 p, 5 fig, 23 tab. OSW Contract 14-01-0001-1666.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Storage, Membranes, Osmosis.

The objective was to develop reliable methods for the protection of reverse osmosis membranes during storage and handling. Practical methods amenable to water treatment plant operations were established to protect reverse osmosis units from bacterial attack. A study of protection of membranes and reverse osmosis units against microbiological action was initiated by screening 25 biocidal compounds. Screening tests resulted in the choice of five biocides for long-term storage tests: formaldehyde, an organic mercury compound, methylene dithiocyanate and two quaternary ammonium salts. They were evaluated at 40, 77 and 95F for periods up to one year along with typical materials of consruction for reverse osmosis systems. Tests were made to ascertain the approximate temperature limits to which membranes could be subjected for months without a change in performance or in physical properties. These limits were chosen as 0 and 140F. After four months storage of membranes, no essential change noted in the reverse osmosis properties or in tensile properties. Dry membranes have been tested as a part of this program because such membranes are less subject to bacterial degradation. A useful dry membrane based on glycerol-Triton X-100 developed earlier was evaluated.
W72-00625

EVALUATION OF CELLULOSE ACETATE MEMBRANE PROPERTIES AS RELATED TO SYSTEM CONFIGURATION,
Universal Water Corp., Del'Mar, Calif.
S. Manjikian, M. Foley, and C. Allen.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No 670, April 1971. 90 p, 16 fig, 24 tab. OSW Contract 14-01-0001-1823.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Membrane properties, Properties, Laboratory tests.

Performance of reverse osmosis membranes in various configurations was investigated. Membranes with different costing formulations and heat treatments were employed. Laboratory bench-scale tests were run to determine effects of composition, membrane stretching and the different membrane shapes. No single procedure or set of conditions could lead to optimum membrane utilization in all support configurations studied. The nature of the casting formulation, fabrication procedures, support configuration, and system application will in general determine membrane physical and performance characteristics. Physical deformation under uniaxial elongation or circumferential expansion is deleterious to membrane performance. Uniaxial stretching of freshly cast membranes prior to the water immersion or complete gelation stage results in membranes of improved selectivity. Membranes utilized in flat systems exhibit high selectivity characteristics while those utilized in tubular systems are characterized by high flux. The effect of increasing brine concentration, pressure and product recovery ratios on membrane performance is more critical in spiral wound systems. Identical membranes in tubular and flat systems will have better performance characteristics in treating highly saline solutions at high operating pressures. Directly cast membrane systems have an inherent disadvantage in application as compared with systems utilizing freely or separately cast membranes. Casting formulations could be modified to produce membranes tailored for use in specific support configurations. (Sieveka-OSW)
W72-00626

A STUDY OF THE PERMEABILITY AND TRANSPORT PROPERTIES OF RECONSTITUTED CELL MEMBRANES,
American Cyanamid Co., Stamford, Conn.
L. S. Meriwether, L. K. Bjornson, and H. F. Jaillet.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.70. Office of Saline Water Research and Development Progress Report No 667, June 1971. 65 p. OSW Contract 14-30-2548.

Descriptors: *Biological membranes, *Membranes, *Reverse osmosis, *Semipermeable membranes, Films, Osmosis, Permselective membranes, Separation techniques, Desalination.
Identifiers: *Lipoprotein films, *Red cell membranes, Membrane protein, Lipid membranes.

A program of exploratory research was undertaken to determine the permeability properties of natural lipoprotein films derived from red cell membranes. This work was divided into: (1) A study of the physical chemistry, especially the preparation variables, of the lipoprotein membranes, and (2) Measurement of the permeability properties of these membranes on porous supports. The surface pressure-area isotherms were determined as a function of subphase cation, anion, ionic strength and pH. The surface chemistry of the isolated membrane protein, model proteins and mixtures of these with extracted lipid was explored on 10mM CaCl2. At-

tempts to measure the permeability of the unsupported lipoprotein film failed. Commercial porous support membranes were dip coated at 10 dynes/cm with the lipoprotein film by a modified Langmuir-Blodgett technique to produce up to 50 layers. Film untake occurred on the upstroke only and was quantitative. Conductance measurements showed essentially no difference in the salt permeability of coated versus uncoated supports. CA films cast from formulations containing small quantities of cell membrane components displayed large changes in water flux without affecting the salt rejection. Increases in water flux were found with ghosts, soluble lipoprotein and isolated protein; a sharp decrease occurred with lipid alone. Similar experiments with cellulose acetate butyrate gave poor results. The results reveal the dramatic effect imparted by natural membrane components on the permeability properties, especially the water flux, of synthetic membranes. Further development of these and similar systems could result in a new type of desalination membrane having improved water flux. Although direct measurement of the permeability properties of the unsupported lipoprotein film was not achieved, study of the physical chemistry of these films provided further insight into the structural organization of biological membranes. (Kindley-OSW)
W72-00627

HIGH RETENTION TUBULAR MEMBRANES FOR REVERSE OSMOSIS,
Aerojet-General Corp., El Monte, Calif.
W. M. King.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.45. Office of Saline Water R and D Progress Report No 682, April 1971. 34 p, 5 tab, 12 fig, 3 ref. OSW Contract 14-01-0001-2224.

Descriptors: *Desalination processes, *Reverse osmosis, *Membrane processes, *Sea water.
Identifiers: Casting variables, Cellulose acetate.

The sodium chloride rejection (99.2%) of the tubular cellulose acetate/cellulose triacetate membranes developed in this program makes them suitable for the single-pass desalination of seawater. Their predicted average flux and total water product over the first year of operation is 12% greater than that of a membrane with an initial flux of 10 gfd and a flux decline parameter of 0.04. (Mintz-OSW)
W72-00628

DEVELOPMENT OF FLOW WORK EXCHANGERS FOR ENERGY RECOVERY IN REVERSE OSMOSIS PLANTS,
Dynatech R and D Co., Cambridge, Mass.
G. B. Gilbert.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No 680, April 1971. 87 p, 25 fig, 9 tab, 5 ref. OSW Contract 14-01-0001-2213.

Descriptors: *Energy transfer, *Reverse osmosis, Desalination apparatus, Desalination processes.
Identifiers: *Flow work exchanger, Energy recovery.

The flow work exchanger is a piston-and-cylinder arrangement in which high-pressure brine discharging from a reverse osmosis desalination system is used to pressurize a portion of the feed stream to the system. Two cylinders are used in the exchanger so as to achieve a nearly-steady output despite the cyclical operation of each cylinder. Two low-pressure-rise pumps are required to make up for friction losses (primarily in the values and piping); one pump is in the high pressure brine and the other in the feed stream. The overall efficiency of the exchanger exceeded 92% in the 9-to-18 gpm capacity range, at system pressures above 1000 psig. (Mintz-OSW)
W72-00629

DESIGN AND FURNISHING FLASH ENHANCERS FOR MSF TEST MODULE,
Desalting Systems and Services, Inc., Fort Lauderdale, Fla.
C. D. Hornburg.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report, February 1971. 51 p, 19 fig. OSW Contract 14-01-0001-2328.

Descriptors: *Desalination apparatus, *Distillation, *Flash distillation, Desalination processes.
Identifiers: Flash enhancers.

A suitable flashing enhancer was developed which will cause more complete flashing especially at the low temperature end of the plant. An enhancer was initially designed and tested in a pilot plant at Wrightsville Beach Test Facility, North Carolina. Based upon the test results, the flash enhancer design was refined and three sets of the enhancers were fabricated for installation in the large multistage flash module at San Diego Test Facility, Chula Vista, California. These enhancers will be installed and tested as part of the development program at San Diego Facility. (Robinson-OSW)
W72-00630

DEVELOPMENT OF MODIFIED PROTEIN FILMS FOR DESALINATION BY REVERSE OSMOSIS,
Harris Research Labs., Rockville, Md.
N. R. S. Hollies, H. Y. Hsiao, and B. S. Watson.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.50. Office of Saline Water Research and Development Progress Report No 663, July 1971. 35 p, 10 ref. OSW Contract 14-30-2540.

Descriptors: *Membranes, *Reverse osmosis, *Semipermeable membranes, Desalination processes, Separation techniques, Osmosis, Permselective membranes, Films, Permeability.
Identifiers: *Zein films, *Protein films, Corn protein, Hollow fibers, Crosslinked zein films.

Zein was prepared in the form of hollow fibers, as ultrathin films on porous substrates, and as flat films, each crosslinked and cured to achieve insolubility in water and withstand the high pressures encountered in reverse osmosis applications. Hollow fibers were prepared by spinning zein dissolved in isopropyl alcohol/water or chloroform/methyl alcohol mixtures to which were added a formaldehyde-type crosslinking agent and catalyst. The hollow fibers were formed in the drying step following spinning and later cured at 150C to achieve stability in water. Similar zein solutions were used to prepare ultrathin zein films on a polyacrylonitrile-polyvinylchloride filter paper (Acropor AN-450) of uniform pore size. Water flux of 1 gfd was achieved at a salt-rejection figure of 65% and 0.4 gfd at 90% rejection for two films tested at 1200 psi after 50 hours of testing at lower pressures. Zein solutions containing a formaldehyde-type crosslinking agent and fortified with a polymer additive such as polyacrylic acid or polyethylene glycol were cast into sheets. Samples of one of these were found to give a water flux in excess of 1 gfd at 94% salt rejection in short-term tests at 600 psi. All reverse osmosis tests were carried out using 0.5% NaCl solutions. (Lee M. Kindley-OSW)
W72-00631

PROPERTIES OF SOLUTIONS,
Oak Ridge National Lab., Tenn.
R. J. Raridon.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.25. Office of Saline Water Research and Development Progress Report No 685, July 1971. 117 p. OSW Contract 14-01-0001-937.

Descriptors: *Saline water systems, *Aqueous solutions, Desalination, *Thermodynamics, Electrolytes, Physiocochemical properties, Ion transport.

Studies were undertaken to provide information on the thermodynamic and transport properties of aqueous and nonaqueous electrolyte solutions and of two-phase equilibria. The specific studies were selected either because of their direct pertinence to desalination problems or because they might reveal information in areas where deeper understanding seemed most urgent. Various standard physical-chemical techniques were employed, including solubility measurements, distribution coefficient measurements, emf measurements, vapor-phase equilibrations and self-diffusion coefficient measurements. Radiometric techniques were used in several cases. This report contains 21 reprints and is divided into parts dealing with (1) properties of aqueous systems, (2) properties of water-organic systems, and (3) high-temperature phase studies. (McCoy-OSW)
W72-00632

CONCEPTUAL DESIGN STUDY ON ELECTRODIALYSIS MEMBRANE ASSEMBLY MODULAR UNIT DESIGN,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
J. Schechter, and C. Forgacs.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No 681, April 1971. 99 p. OSW Contract 14-01-0001-1810.

Descriptors: *Desalination, *Electrodialysis, *Membranes, Membrane processes, Design, Desalination apparatus.

Two alternative types of a new Electrodialysis Membrane Assembly Modular Unit are presented. These units utilize two concepts, namely, the cross flow of the two process streams and the thin and short diluate compartment. Detailed design performance data and cost estimates are given. The new units seem superior to those in current practical use. Their main feature is that they enable single stage desalination of almost any type of brackish water. Approximate economic calculations show that brackish water can be desalinated in large electrodialysis plants based on these modular units at a total production cost of 28-32 cents/1000 gal (depending on membrane price) in 1 MGD plants, and at 16-19 cents/1000 gal in 50 MGD plants (excluding scale control). The total capital cost per gallon per day production would be 47-53 cents for 1 MGD plants and 23-29 cents for 50 MGD plants. (Mintz-OSW)
W72-00633

LARGE DESALTING PLANTS: PROGRESS IN TECHNOLOGY - APPLICATIONS OF ATOMIC ENERGY,
International Conference on the Peaceful Uses of Atomic Energy, Geneva (Switzerland).
E. H. Sieveka, and I. Spiewak.
Availability: Unipub, Inc, P. O. Box 433, New York, N. Y. 10016. 1971 Geneva Conference Paper, Nuclear USA - Vol 1, A/CONF-49/P-051, p 1.9-15-31.

Descriptors: *Desalination, *Nuclear powerplants, *Saline water conversion, *Water quality, *Desalination plants, *Desalination processes, Reclaimed water, Agriculture, Agronomy, Operating cost, Operations, Crops, Irrigation practices, Soil management.
Identifiers: Crop science.

With million-gallon-per-day desalting plants now an established new source of fresh water from the seas, the Office of Saline Water is moving ahead with a program to further advance technology for super-sized production plants. Although, through

the use of multi-stage flash (MSF) module at the San Diego Test Facility, OWS can report that a 50-million-gallons-per-day (MGD) MSF plant could be built with confidence on the basis of present technology. This 2.6 MGD module has been operating for 3 years. It has provided data on acceptable operating methods, means of controlling large systems, and component designs for plants in the size range of 50 MGD. Serving as basic units, these 50 MGD plants could be combined and utilized for the production of 150 MGD or more of fresh water. Studies indicate that construction of a 250 MGD MTE/MSF plant could be accomplished at a reduction of about 30 percent in capital cost relative to an MSF plant and a resulting decrease of 15 percent in product water cost. It can be stated that significant reductions in water cost have been achieved, and that continued effort should bring about additional progress. The combination of seawater distillation with nuclear power production in large dual-purpose plants appears to be an important step in making desalting a major contributor to water supply in the future. Many thousands of megawatts of nuclear capacity will be designed in this form in the next 30 years. (Houser-NSIC)
W72-00952

NUCLEAR USA - PEACEFUL USES OF ATOMIC ENERGY, VOL 1 AND 2, GENEVA, SWITZERLAND, SEPTEMBER 6-16, 1971.
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).

Availability: Unipub, Inc, P.O. Box 433, New York, N.Y. 10016. Nuclear USA, Vol 1 and 2, A/CONF-49/P, September 6-16, 1971.

Descriptors: *Nuclear powerplants, *Thermal powerplants, *Environmental effects, *Water pollution effects, Rivers, Aquatic life, Desalination, Water resources, Water quality, Agronomy, Saline water conversion, Irrigation practices, Soil management, Crops.

A total of 59 US papers for the Fourth United Nations International Conference on the Peaceful Uses of Atomic Energy held in Geneva, Switzerland, September 6-16, 1971. Many aspects of reactor development are discussed including safety, costs, desalination, agroindustrial complex, fuels costs and their management, radiation effects, waste management, legislative and regulatory aspects, medical applications of radioisotopes, radiation biology, and international cooperation in the nuclear industry. (Houser-NSIC)
W72-00954

NUCLEAR POWER FOR DESALINATION AND AGRO-INDUSTRIAL COMPLEXES,
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).
James T. Ramey, and R. Phillip Hammond.
Availability: Unipub, Inc, P.O. Box 433, New York, N.Y. 10016. 1971 Geneva Conference Paper, Nuclear USA - Vol 1, A/CONF-49/P-05D, p 1.9 thru 1.9-14.

Descriptors: *Nuclear powerplants, *Desalination, *Saline water conversion, *Water quality, *Desalination plants, *Desalination processes, *Water control, *Water treatment, Reclaimed water, Irrigation systems, Water resources, Agriculture, Agronomy, Crops, Irrigation practices, Soil management.
Identifiers: Agro-Industrial complex.

Of equal importance, with nuclear energy as a power source, the vast energy resources of the atom would be joined with the unlimited waters of the sea to provide a long-term solution to two of man's most fundamental needs--energy and water. The use of nuclear energy would also make large-scale desalting free of dependence on nearby sources of conventional energy, whether hydraulic or fossil, and enable it to be applied throughout the world's coastal regions. It thus creates the prospect of opening up for extensive human habitation vast areas of presently barren territory in many arid regions of the world. In so doing, nuclear desalting offers a solution to the problem of meeting still another of man's fundamental needs--that for land. The combination of all of these--energy, water and land--leads directly to the creation of new food resources. Thus, large-scale nuclear desalting offers the prospect of a major breakthrough in meeting the most basic needs of the world's growing population. The need for energy centers are discussed along with their many possibilities and application. (Houser-NSIC)
W72-00955

INFLUENCE OF IRON ON THE PHYSICOCHEMICAL STATE OF RADIOELEMENTS IN SEA WATER,
R. N. Bernovskaya, and Yu. A. Bogdanov.
Soviet Radiochemistry, Vol 13, No 1, p 158-160, January-February, 1971.

Descriptors: *Water pollution treatment, *Radioactivity techniques, *Radioisotopes, Sorption, Adsorption, Chemical precipitation, Solubility, Hydrogen ion concentration, Sea water, On-site investigation, Cruises, Radiochemical analysis, Tracking techniques, Tracers, Water pollution effects, Environment, Nuclear wastes, Iron compounds.
Identifiers: Niobium radioisotopes, Cerium radioisotopes, Yttrium radioisotopes, Iron radioisotopes.

In pH 8 sea water, 80% of the iron is in the form of an insoluble suspension (FeOH). Removal of 25 microg/l of certain radionuclides (Ce-144, Y-91, Nb-95) was about 90% by coprecipitation with about 25% microg/l of iron; but removal of others (Co-57, Tc-99) was small. It is suggested that such a treatment may be useful for radioactive-effluent decontamination or in radiochemical analysis, and that iron probably plays a role in the transport of fission fragments in the environment. (Bopp-NSIC)
W72-00956

WATER PERMEATION ACROSS ULTRATHIN (BLACK) LIPID MEMBRANES,
Michigan State Univ., East Lansing.
H. T. Tien.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $0.35. Office of Saline Water Research and Development Progress Report No. 696, September 1971. 23 p, 5 fig, 3 tab. Grant No. 14-01-0001-2122.

Descriptors: *Membranes, *Permselective membranes, Osmosis, Permeability, Lipids, Films, Thin films, Biological membranes, Photoactivation, *Desalination.
Identifiers: *Black lipid membranes, *Water transport, Chloroplasts, Ultrathin films, Photoactive pigments.

The black lipid membranes (BLM) of Rudin-Mueller-Tien type have been studied with the objective to determine the mechanism of water transport and to relating the effect of structure or composition of the latter to their water/salt transport properties. The effects of physical parameters such as pressure, concentration, and electrical potential differences on the transport of water and various solutes were also investigated. The water permeability coefficients, Po, were determined for BLM formed from oxidized cholesterol, cholesterol-DAP (dodecyl acid phosphate), cholesterol-HDTAB (hexadecyl-trimethylammonium bromide), and chloroplast extracts. The temperature dependence of Po for BLM generated from chloroplast extracts was also measured in the range of 17.5-34.0C. Experimental activation energy was calculated to be 4.2 plus or minus 0.5 Kcal/mole. From the temperature-permeability coefficient data, various derived quantities from absolute reaction rate theory have been evaluated. With the chloroplast BLM it has been demonstrated that photoelectric effects are possible. Further, it has been observed that transport of water can be initiated by light. The best value obtained is 70 mu l/sq hr-cm. BLM constituted from photoactive pigments are a unique model system for study which could aid in the understanding and exploitation of the photolysis of water. (OSW abstract)
W72-01113

ENGINEERING AND ECONOMIC EVALUATION OF GATX CONCEPTS FOR REVERSE OSMOSIS MODULES USING POROUS TUBES WITH EXTERNAL MEMBRANES,
Kaiser Engineers, Oakland, Calif.
F. L. Harris, and G. B. Humphreys.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $0.50. Office of Saline Water Research and Development Report No. 642, April 1971. 46 p, 6 tab, 7 ref. Contract No. 14-01-0001-1669.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Membrane processes, Costs.
Identifiers: External membranes.

The results of an engineering and economic evaluation of three reverse osmosis concepts developed by the General American Research Division of General American Transportation Corporation are presented. The three designs, based on porous support tubes with external membranes in a shell-and-tube configuration, are 'conventional' shell-and-tube, spiral baffle, and concentric helical. The following factors are considered in the evaluation: the hydrodynamic analysis, the module components, the costs for large-scale plants, and the advantages or disadvantages of each concept as compared to large-scale tubular module design. The spiral baffle and concentric helical concepts do not warrant further development and the shell-and-tube design should be further studied and analyzed. (OSW abstract)
W72-01114

A COST EFFECTIVENESS STUDY ON PRETREATMENT METHODS SUITABLE FOR INTEGRATION TO MEMBRANE DESALTING PLANTS,
Permutit Research and Development Center, Princeton, N.J.
J. S. Kneale, and E. M. Kelley.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $2.75. Office of Saline Water Research and Development Progress Report No. 425, May 1969. 241 p, 3 tab, 16 fig, 8 ref. Office of Saline Water Contract 14-01-0001-1259.

Descriptors: *Desalination, *Membrane processes, Brackish water, Cost analysis, Desalination apparatus.
Identifiers: *Pretreatment.

The cost of pretreatment is extremely high for the benefits derived. The final economics of including pretreatment in a membrane desalting plant can only be determined when these data are included in a complete plant study including waste disposal. There is no universal treatment method that can cover all flow rates and raw water characteristics. Each brackish water being considered should be studied individually. The type of membrane desalting process, electrodialysis or reverse osmosis, will have considerable influence on the extent of the pretreatment required. The installed cold process costs can be applied to waters other than those included in this study with more accuracy than can the ion exchange costs. The total operating cost is heavily influenced by the chemical composition of the water. Since the cost of chemicals is a major operating cost, the recovery of reacting chemicals from the waste streams should be considered in the economic analysis of large plants (over 5 mgd). (OSW abstract)
W72-01115

DEVELOPMENT OF POLYPHENYLENE OXIDE MEMBRANES,
General Electric Co., Lynn, Mass.
P. Chludzinski, J. F. Austin, and J. Enos.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $1.25. Office of Saline Water Research and Development Report No. 697, June 1971. 65 p, 21 fig, 7 tab. OSW 14-30-2627.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Ion exchange, Brackish water.
Identifiers: Sulfonated polyphenylene oxide.

The reproducibility of the manufacturing process used to produce sulfonated polyphenylene oxide membranes was improved for use in the reverse osmosis purification of brackish water. A final polymer and membrane manufacturing procedure was devised based on the effects of various process variables on membrane performance. Three final batches each consisting of seven to twelve membranes were manufactured and found to be reproducible in flux to about plus or minus 25% and in rejection to plus or minus 5%. The reproducibility of flux of different pieces within any one membrane was within plus or minus 3%, suggesting that the wider variation in performance from membrane to membrane was due to human factors in the manual casting step. Although the performance varied plus or minus 25%, the final membranes fabricated to verify the manufacturing process showed that 96% of the membranes equalled or exceeded the contract goals. That is, almost all of the final membranes showed better than 25 gfd flux and 85% salt rejection when operated on natural Webster water at 1100 psig and 130F. (OSW abstract)
W72-01116

SEAWATER TUBULAR REVERSE OSMOSIS MEMBRANES,
Envirogenics Co., El Monte, Calif.
W. M. King, and M. L. O'Hair.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $0.70. Office of Saline Water Research and Development Report No. 695, June 1971. 42 p, 11 tab, 16 fig, 3 ref. OSW 14-30-2664.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Seawater, *Desalination apparatus.
Identifiers: Cellulose acetate, Tubular element, Membrane casting variables.

When extruded into Dacron liners and tested with 3.5% sodium chloride at 1500 psi, membranes prepared from casting solutions comprised of cellulose acetate, E-398-3, cellulose triacetate, A-432-130B, dioxane, acetone and acetic acid typically exhibit initial fluxes of 10 to 12 gfd and greater than 99% salt rejection. The same membranes have been evaluated with actual seawater in the laboratory in a portable module consisting of ten 5-ft long, 9/16-in. diameter tubular membrane elements, feed pump, high pressure pump, filter and associated controls. A logarithmic flux-time slope of 0.042 was calculated for the 317 hr test period, which coupled with an initial flux of 11.7 gfd should produce and annual productivity equal to a membrane with an initial flux of 10 gfd and a logarthmic flux-time slope of 0.024. The salt rejection of 99.3% is ample for the single-pass desalination of seawater at economical recovery rates. (OSW abstract)
W72-01117

REGENERATION OF CELLULOSE ACETATE MEMBRANES,
Envirogenics Co., El Monte, Calif.
W. S. Higley, and C. W. Saltonstall, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $0.40. Office of Saline Water Research and Development Report No. 694, June 1971. 30 p, 10 tab, 3 ref. OSW 14-30-2646.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Repairing, Sealants.
Identifiers: *Membrane regeneration, Membrane cleaning, Flux restoration, Cellulose acetate.

The regeneration and repair of membranes on this program was conducted using two different types of cellulose acetate membrane. The regeneration process, using hot dilute acetic acid solution was optimized for use with compacted cellulose diacetate membranes with a degree of substitution (ds) of 2.45. This process was not successful, however, with compacted membrane prepared from a blend (ds 2.63) of cellulose diacetate and cellulose triacetate. For these membranes, an ambient temperature process was developed using a much stronger acetic acid solution. Periodic regeneration and long-term flux decline studies were conducted. The ambient temperature regeneration process was successfully demonstrated with tubular blend membranes but requires further modifications for its complete adaptation. Essentially complete repair of membranes containing punched holes was demonstrated using membrane sealants in colloidal form. (OSW abstract)
W72-01118

3B. Water Yield Improvement

SYMPOSIUM ON ENGINEERING WITH NUCLEAR EXPLOSIVES.
American Nuclear Society, Washington, D.C.; and Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-00966

NUCLEAR EXPLOSIVES IN WATER--RESOURCE MANAGEMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-00969

PROJECT AQUARIUS - CONTROL OF RADIOISOTOPES AND SAFETY,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 08H.
W72-00970

3C. Use of Water of Impaired Quality

SOILS OF THE ARID ZONE AS AN OBJECT OF IRRIGATION, (IN RUSSIAN).

222p. Illus. Nauka: Moscow. 1968.
Identifiers: Arid, Desalination, Dokuchaev, Institute, Irrigation, Science, Soil, Soils, Stable, USSR, Zone.

A description is given of the possible sources of soil salination in the desert zone, the modes of migration of salts and their accumulation in soils and groundwaters, distribution of saline soils, types of watersalt balance, irrigation waters and their classification. The optimum irrigation regimes for soils on Soviet Asian territories are examined. Conditions for stable desalination of saline soils and means for their agricultural utilization are considered.--Copyright 1971, Biological Abstracts, Inc.
W72-00672

SALINITY RESPONSE OF CULTIVARS OF BUFFEL GRASS (CENCHRUS CILIARIS),
Dep. Primary Ind., Blackall, Qucensl., Aust. Department of Primary Industries, Blackall (Australia).
T. W. G. Graham, and L. R.Humphreys.
Aust J Exp Agr Ahim Husb. 10 (47): 725-728. Illus. 1970.
Identifiers: Buffel, Cenchrus-Ciliaris-M, Cultivars, Grass-M, Salinity, Yields.

Five buffel grass cultivars were grown in solution culture at levels of 0.5, 40, 80, and 160 meq NaCl/1. Yields did not differ between cultivars at the highest level of NaCl, and the more productive cultivars under low salinity conditions, Tarewinnabar, Biloela, and American, suffered greatest potential yield reduction and accumulated highest Na concentrations. Biloela cultivar maintained relatively high yields up to the 80 meq NaCl/level.--Copyright 1971, Biological Abstracts, Inc.
W72-00683

SALT TOLERANCE STUDIES ON SOME BAJRA (PENNISETUM TYPHOIDES) VARIETIES AT GERMINATION STAGE,
G. L. Maliwal, and K. V. Paliwal.
J Indian Soc Soil Sci. 18 (2): 209-214. 1970.
Identifiers: Bajra-M, Germination, Irrigation, Pennisetum-Typhoides-M, Salt, Tolerance, Varieties.

Fifteen P. typhoides varieties were studied for the relative salt and alkali tolerance at germination stage using 5 levels each of salinity and sodium adsorption ratio (SAR). The time of emergence was delayed and the percentage germination decreased as the salinity, SAR or both were increased. Multiple correlation showed that germination is more adversely affected by increase of salinity than SAR. Significant varietal differences in salt tolerance at the germination stage were observed.--Copyright 1971, Biological Abstracts, Inc.
W72-00689

RESIDUAL SALINIZATION OF VIRGIN SOILS AND GROUNDWATER IN THE SOUTHWESTERN PART OF THE GOLODNAYA STEEPE (OSTATOCHNOYE ZASOLENIYE TSELINNYKH POCHV I GRUNTOVYKH VOD YUGO-ZAPADNOY CHASTI GOLODNOY STEPI),
Central Asian State Inst. for the Design and Planning of Irrigation Structures and Rural Electric Powerplants, Tashkent (USSR).
V. V. Maslennikov.
Pochvovedeniye, No 1, p 43-50, January 1971. 1 fig, 3 tab, 4 ref.

Descriptors: Salinity, *Salts, *Groundwater, *Land reclamation, Water quality, Water chemistry, Water analysis, Chemical analysis, Soil physical properties, Particle size, Carbonates, Chlorides, Sulfates, Subsurface drainage, Irrigation, Drainage practices, Drainage systems, Grasslands.
Identifiers: *USSR, *Golodnaya Steppe, *Salinization, Secondary salinization, Residual salinization, Virgin soils, Alluvial fans.

One of the basic causes of secondary salinization on newly reclaimed lands of the Golodnaya Steppe is the deep residual salinization of the soils and groundwater. Subsurface drainage conditions are poor in the southwestern part of the steppe due to the absence of permeable rocks, while the presence of salts in the soils and groundwater creates favorable conditions for secondary salinization. Four soil-reclamation regions are identified on the basis of the hydraulic properties of the soils, the nature and degree of salinity of the soil and groundwater, and the drainage conditions: (1) the region of sulfate salinization; (2) the region of sulfate accumulation but with a higher content of chlorides; (3) the region of chloride-sulfate accumulation; and (4) the region of sulfate-chloride salinization. The critical groundwater depths for these regions are 2-2.2 m; 2.2-2.4 m; 2.4-2.6 m; and 2.6-2.8 m, respectively. A collector-drainage system is required to prevent secondary salinization and to create optimum conditions for the improvement of irrigated lands. The density of the system must conform to the critical groundwater depths indicated. (Josefson-USGS)
W72-00806

3F. Conservation in Agriculture

WATER-SOLUBLE N03-NITROGEN, PO4--PHOSPHORUS, AND TOTAL SALT

BALANCES ON A LARGE IRRIGATION TRACT,
Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center.
For primary bibliographic entry see Field 05B.
W72-00597

VARIATION OF THE CHEMICAL PROPERTIES OF CHESTNUT SOILS WITH AND WITHOUT IRRIGATION, (IN RUSSIAN),
For primary bibliographic entry see Field 02G.
W72-00675

AGROCHEMICAL AND BIOLOGICAL FEATURES OF ERODED SOILS, (IN UKRAINIAN),
M. I. Osadchyi, and L. F. Vorobei.
Zemlerobstvo Respub Mizhvid Temat Nauk Zb. 15. 92-95. 1968. Russian summary.
Identifiers: Agrochemical, Bacteria, Biological, Carbon, Di, Eroded, Fertilizers, Humus, Mineral, Nitrifying, Oxide, Soils.

Increase in the degree of erosion was associated with diminished contents of humus, total and mobile N, mobile P2O5, and low liberation rate of CO2 and a low water status. Nitrifying bacteria were scant and inactive. Microbiological processes were promoted by fertilizers.--Copyright 1971, Biological Abstracts, Inc.
W72-00676

EFFECT OF CERTAIN REGULATORS ON COTTON GROWTH, DEVELOPMENT AND YIELD IN DIFFERENT WATER SUPPLY, (IN RUSSIAN),
N. Durdyev, and D. Agakishiev.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 3. 23-27. 1970, English summary.
Identifiers: Cotton-D, Development, Growth, Regulators, Water yield.

Spraying of cotton leaves by a 0.2% retardant solution at the period of budding and by 0.05%-at the period of blossoming (at 40-70% of soil moisture) sharply inhibited plant growth. To provide more efficient application of retardant at 40% of soil moisture, presowing seeds' retting is required. At the period of blossoming spraying of plants by 0.01%--retardant is highly effective if the soil moisture is 70%.--Copyright 1970, Biological Abstracts, Inc.
W72-00681

THE EFFECT OF FERTILIZER NITROGEN ON THE PRODUCTION OF IRRIGATED PASTURE WITH AND WITHOUT CLOVER,
Ruakura Agricultural Research Center, Hamilton (New Zealand).
W. C. Weeda.
N Z J Agr Res. 13 (4): 896-908. 1970.
Identifiers: Clover-D, Cocksfoot-M, Dactylis-Glomerata-M, Europe, Fertilizer, Grass-M, Irrigated, Lolium-Perenne-M, Nitrogen, Pasture, Perennial, Production, Rye, USA, Yield.

Yield responses of irrigated pasture to nitrogenous fertilizer were studied on a grass/clover sward and on a grass sward. At rates of application of up to 400 lb N/acre/yr responses on a grass/clover sward averaged 5 to 6 lb dry matter/lb of fertilizer nitrogen in a mowing trial. The amount of fertilizer N required on a grass sward to equal the yield of a grass/clover sward receiving no fertilizer N was 450 lb to 500 lb under mowing conditions (annual yield 14,000 lb dry matter/acre) and approximately 300 lb under grazing (annual yield 17,000 lb dry matter/acre). Suppression of white clover by high rates of fertilizer N was much less severe than usually found in experiments in Europe and the USA. At a rate of application of about 800 lb N/acre/yr on a grass/clover sward, white clover still accounted for 15% of the yield, but at an application rate of 250 lb to 300 lb fertilizer N per acre, white clover apparently ceased to make a positive contribution to the N supply of associated grasses. Grown as pure swards receiving 360 lb fertilizer N/acre/yr, cocksfoot (Dactylis glomerata L.) gave a higher summer and annual yield than perennial ryegrass (Lolium perenne L.).--Copyright 1971, Biological Abstracts, Inc.
W72-00682

EFFECT OF NON-UNIFORM ROW GRADES ON YIELDS OF IRRIGATED FIELD CROPS,
Arkansas Univ., Fayetteville. Dept. of Agricultural Engineering.
Warren Harris.
Arkansas Agr Exp Sta Bull. 757. 1-24. Illus. Map. 1970.
Identifiers: Bean-D, Cotton-D, Crops, Field, Grades, Irrigated, Non-uniform, Row, Soy, Yields.

The relationships between yields of row crops irrigated by the furrow method on Mississippi Delta (semi-humid climate) soils having restricted internal drainage, steepness of row grades and positions in rows were studied. Yield data were obtained down field rows from plots selected to provide maximum ranges in row grades and positions in rows (lengths of rows). Multiple regression analyses were used to test for correlations on positive row grades; the 't' test was used for significant differences between yields from positive row grades and from depressional plots. The yields did not vary with row grades. Shallow depressions of less than 0.10 ft adversely affected yields of such crops as cotton, that have a low tolerance to inadequate surface drainage. Shallow depressions as deep as 0.20 ft may not affect yields of such crops as soybeans, that have a higher tolerance to inadequate surface drainage. Row crops were satisfactorily irrigated on row grades that varied as much as 0.00%-2.0% with row lengths of 1,300 ft or longer.--Copyright 1971, Biological Abstracts, Inc.
W72-00684

NITROGEN UPTAKE OF PLANTS AFFECTED BY WINDBREAKS,
Department of Fisheries and Forestry, Winnipeg (Manitoba).
S. R. H. Shah, and Y. P. Kalra.
Plant Soil. 33 (3): 573-580. Illus. 1970.
Identifiers: Cottonwood-D, Evapo, Nitrogen, Plants, Populus-D, Rate, Salix-D, Strawberry-D, Temperature, Transpiration, Uptake, Willow-D, Windbreaks.

For this study strawberry plants were selected, and windbreaks consisted of cottonwood (Populus sp.) and willow (Salix sp.). N uptake by the plants in the protected zone was 52% higher than those in the unprotected zone. This was due to the windbreak which favorably influenced the temperature and the evapotranspiration rate resulting in the better growth and yield of plants.--Copyright 1971, Biological Abstracts, Inc.
W72-00685

GROWING ROSE PELARGONIUM UNDER CONDITIONS OF OPEN HYDROPONICS, (IN RUSSIAN),
Akademiya Nauk Armyanskoi SSR, Erevan. Institut Agrokhimicheskikh Problem i Gidroponiki.
For primary bibliographic entry see Field 02I.
W72-00686

EFFECT OF SOIL MOISTURE STRESS ON UPTAKE AND RECOVERY OF TAGGED NITROGEN BY WHEAT,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
E. A. Paul, and R. J. K. Myers.
Can J Soil Sci. 51 (1): 37-43. 1971.
Identifiers: Denitrification, Moisture, Nitrogen, Nutrient, Recovery, Soil, Stress, Tagged, Uptake, Wheat-M.

Labelled 15NH4NO3 was used in a growth chamber to study the effect of moisture stress on the utilization of N by wheat. This made it possible to determine the recovery of N in the soil-plant system of 2 Chernozemic soils. Moisture stress effects were less evident in a clay soil than in a loam. Approximately 55% of the N utilized by the growing plants came from organic soil-N mineralized during the growing period. From 59 to 71% of the initial fertilizer plus soil mineral-N was utilized by the plants. Twenty to 36% remained in the soil, and 1 to 17% was lost. Losses were greatest in soils exposed to high moisture stress and were related to the residual NO3-N levels in the soil. They were attributed to denitrification. Immobilization of N was highest at low moisture stress where plant growth was the greatest, but mineralization was unaffected by the moisture stress applied. From 5.0 to 6.2 kg N were required to produce 100 kg of wheat, the highest efficiency of N utilization being obtained at low soil moisture stress.--Copyright 1971, Biological Abstracts, Inc.
W72-00687

A STUDY OF NEW ZEALAND WHEATS: III, EFFECTS OF SOIL MOISTURE STRESS AT DIFFERENT STAGES OF DEVELOPMENT,
Lincoln Coll., Canterbury (New Zealand).
R. H. M. Langer, and A. Ampong.
N Z J Agr Res. 13 (4): 869-877. 1970.
Identifiers: Anthesis, Apical, Development, Grain, Meristem, Moisture, New Zealand, Soil, Stress, Wheats-M, Yield.

Single plants of Arawa and Hilgendorf 61 wheat growing in pots were exposed to soil moisture stress at different stages of development. Plants treated when the apical meristem had reached the double-ridge stage had fewer spikelets than plants treated later, but the greatest effect on grain yield occurred through reduction of grain number in plants subjected to dry conditions from the time of spikelet formation. Single grain weight was most affected by moisture stress imposed at ear emergence. Treatment after anthesis reduced single grain weight in Arawa but not in Hilgendorf 61. Plant height was reduced most if water shortage occurred before ear emergence.--Copyright 1971, Biological Abstracts, Inc.
W72-00688

EFFECT OF TIME, CULTIVATION AND UREA ON NITROGEN STRESS AND YIELD OF WHEAT IN A LOW RAINFALL AREA OF WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Floreat Park (Australia). Div. of Plant Industry.
E. A. N. Greenwood, W. J. R. Boyd, J. A. Whitehead, and Z. V. Titmanis.
Aust J Exp Agr Anim Husb. 10 (47): 763-767. 1970.
Identifiers: Australia, Control, Cultivation, Grain, Herbicides, Low, Nitrogen, Rainfall, Stress, Time, Urea, Weed, Western, Wheat-M, Yield.

Wheat was grown where N fertilizer does not usually produce a large increase in grain yield. Urea was applied at sowing rates from 0-75 kg N/ha and the crop was sown either after cultivation or without cultivation but with the weed controlled with herbicides, a promising technique for earlier planting. Estimates of weeds and growth, N content, N stress, and grain yield of the crop were made at appropriate times. Maximum N stress occurred during tillering. The response by grain yield to urea was small and could be explained only in part by the relatively low values of N stress at that time. Where cultivation was replaced by herbicides, N stress was greater and growth rate, N uptake and grain yield were lower. Application of 75 kg N/ha at sowing compensated for lack of cultivation during the vegetative stage but did not fully do so for grain yield.--Copyright 1971, Biological Abstracts, Inc.
W72-00690

EFFECT OF NITROGEN, ZINC, COPPER AND MANGANESE ON YIELD AND CHEMICAL COMPOSITION OF IRRIGATED WINTER WHEAT IN IRAN,
College of Agriculture. Pahlavi Univ., Shiraz (Iran).
A. Kashirad.
Isr J Agr Res. 20 (4): 179-182. 1970.
Identifiers: Chemical, Composition, Copper, Iran, Irrigated, Manganese, Nitrogen, Wheat-M, Winter, Yield, Zinc.

A fertilizer experiment was carried out on a calcareous silty clay soil with pH 8.2. The application of 20 kg Zn or Mn in addition to 50 kg N resulted in a grain yield increase of over 1/2 ton/ha than without N. Straw yield increased close to 2 tons/ha following the application of Cu, Zn and Mn in addition to N; such applications also increased significantly the P and K content of the straw. The Cu, Zn and Mn content of the grain and the straw increased significantly after the application of these elements, and even more so when N also was applied.--Copyright 1971, Biological Abstracts, Inc.
W72-00691

SOME ASPECTS OF THE MINERAL NUTRITION OF CULTIVATED PLANTS OF THE FLUVIAL-LACUSTRINE SOILS FROM THE DANUBE FLOOD PLAIN. 1. CORN, (IN RUMANIAN),
Institutul Agronomic, Bucharest (Rumania).
G. Bilteanu, Aurora Radoi, and Olga Nica.
Stud Cercet Biol Ser Bot. 22 (2): 125-137. Illus. 1970. English summary.
Identifiers: Bean-D, Beet-D, Corn-M, Cultivated, Danube, Fertilizers, Flood, Fluvial, Grass-M, Lacustrine, Millet-M, Mineral, Nutrition, Plain, Plants, Soils, Sorghum-M, Soy, Sudan, Sugar, Sunflower-D, Yield.

Corn was grown in pots on fluvial-lacustrine soils which were rich in humus, the pH in H2O was over 7.5, and 90% of the granulometric structure was made up of fractions exceeding 0.01 mm in diameter. The corn had a significant P deficiency in the 1st 2-3 yr. P deficiency disappeared with soil tillage and corn growing. The lower layers of the fluvial-lacustrine soils (below 20 cm) were poor in nutrients particularly in P and the corn grown on these layers developed poorly even if NPK fertilizers were supplied. The yields of corn grown after sunflower, soybeans, beans and sugar beet were higher than those of corn grown after corn. However, poor yields were obtained when growing corn after sorghum. Sudan grass and millet.--Copyright 1971, Biological Abstracts, Inc.
W72-00692

COMPARISON OF THE RESPONSES OF SOME INDIAN AND SEMI-DWARF MEXICAN WHEATS TO NON-IRRIGATED CULTIVATION,
Indian Agricultural Research Inst., New Delhi.
A. K. Bagga, K. N. Ruwali, and R. N. Asana.
Indian J Agr Sci. 40 (5): 421-427. Illus. 1970.
Identifiers: Cultivation, Dwarf, Indian, Mexican, Semi, Non-irrigated, Wheats-M.

Under non-irrigated cultivation, in 4 seasons cultivars NP 858 and NP 860 gave consistently higher grain yields than NP 823, NP 876, and semi-dwarf Mexicans Sonora 63, Sonora 64 and Lerma Rojo. The better adaptability of NP 858 and NP 860 is attributed to their root system, which exploited moisture from deep soil zones, and the growth of which was associated with time of earing. A semi-dwarf selection, S 227, performed equally well and had growth attributes similar to NP 858 and NP 860 in 2 seasons, indicating the possibility of utilizing semi-dwarf forms for non-irrigated (barani) cultivation. There was an indication of an association between grain yield and areas of flag and penultimate leaves.--Copyright 1971, Biological Abstracts, Inc.
W72-00693

ON MINERAL NUTRITION OF PLANTS CULTIVATED ON FLUVIAL-LACUSTRINE SOILS IN THE DANUBE PLAIN: II. SOYBEAN, (IN RUMANIAN),
Institutul Ageonomic, Bucharest (Rumania).
G. Bilteanu, Aurora Rada, and Olga Nica.
Stud Cercet Biol Ser Bot. 22 (3): 223-235. Illus. 1970. English summary.
Identifiers: Bean-D, Corn-M, Cultivated, Danube, Deficiency, Fluvial, Lacustrine, Mineral, Nodulation, Nutrition, Phosphorus, Plain, Plants, Romania, Root, Soils, Soy.

Soybeans developed and grew well on the fluvial-lacustrine soils even in the 1st yr. No symptoms of P deficiency, common in corn, were noticed in soybeans. When grown in the upper layer (0-20 cm), no soybean response to fertilizer was noticed. N absence in the fertilizing formula brought about a large number of nodules on soybean roots. This number was much lower when the fertilizing formula included N.--Copyright 1971, Biological Abstracts, Inc.
W72-00694

REGULATING THE GROUNDWATER REGIME OF EXCESSIVELY WET LANDS (REZHIM GRUNTOVYKH VOD PEREUVLAZHNENNYKH ZEMEL' I YEGO REGULIROVANIYE),
For primary bibliographic entry see Field 02G.
W72-00815

CENTER PIVOT IRRIGATION SYSTEMS,
Colorado State Univ., Fort Collins. Agricultural Extension Service.
D. L. Miles.
Electricity on the Farm, p 4-5, May 1970. 1 fig. OWRR Project B-039-COLO (3).

Descriptors: *Sprinkler irrigation, *Water distribution (Applied), *Water management (Applied), *Rates of application, *Treatment, Water conservation, Irrigation efficiency, Irrigation systems, Application methods, Drops (Fluids), Labor, Operation and maintenance, Tillage, Planting management, Pressure head, Pipes, Friction, Great Plains, Grading, Retention.
Identifiers: *Center pivot irrigation.

Center pivot irrigation systems are popular in the Great Plains. They have low labor and maintenance requirements, but serious traction (bogging) and water distribution problems. Traction problems are reduced by grading tracts and leveling land holes. Uniform water distribution is obtained by low application rates. High water pressure is necessary to cause break up of sprinkler drops, pipe size must be such as to reduce friction losses. Special tillage and planting procedures are useful in water retention. Pre-irrigation is important to fields which obtain water only sprinkler irrigation. (Popkin-Arizona)
W72-00877

CENTER-PIVOT SPRINKLERS HAVE WIDE APPLICATION,
Colorado State Univ., Fort Collins. Agricultural Extension Service.
D. L. Miles.
Colorado Rancher and Farmer, September 1970. 2 fig. OWRR Project B-039-COLO (5).

Descriptors: *Sprinkler irrigation, *Irrigation efficiency, *Water management (Applied), *Irrigation practices, *Irrigation systems, Water conservation, Drops (Fluids), Treatment, Labor, Operation and maintenance, Colorado, Soil physical properties, Water distribution (Applied), Tillage, Planting management, Pressure head, Pipes, Friction, Moisture uptake.
Identifiers: *Center-pivot sprinklers.

The application of center-pivot sprinklers is discussed in relation to irrigation management practices. Labor and maintenance requirements for center-pivot sprinklers are low, and such irrigation systems are popular in Colorado. Soil characteristics effect water intake and distribution, and must be considered for irrigation efficiency and water conservation. Special tillage and planting procedures, and crop residues, are helpful in distributing irrigation water. Pre-irrigation is an important practice for water intake problems. High water pressure (80 to 90 psi) is needed to get good sprinkler drop break-up. Pipe size is important in reducing friction or keeping pressure. Leveling of potholes and tract reduction is recommended for land treatment. (Popkin-Arizona)
W72-00878

WATER INTAKE UNDER HIGH APPLICATION RATE SPRINKLING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. W. Addink, and D. L. Miles.
Washington State University, 1971, presented at the American Society of Agricultural Engineers, Annual Meeting, Paper 71-202. 27 p, 13 fig, 8 tab, 10 ref. OWRR Project B-039 COLO (2).

Descriptors: *Sprinkler irrigation, *Rates of application, *Irrigation efficiency, *Application methods, *Water distribution (Applied), Laboratory tests, Design, Hydrologic data, Equations, Labor, Operation and maintenance, Pressure head, Retention, Infiltration, Moisture uptake.
Identifiers: *Center pivot irrigation.

Water intake rate and moisture depth were analyzed in laboratory studies on loam and applied to center pivot sprinkler patterns. Center pivot irrigation systems have low labor and maintenance requirements, but present serious water distribution and infiltration problems. Four irrigation patterns were designed and tested. Data was related to infiltration equations, and calculations of depth and efficiency of irrigation were made. The best irrigation pattern was a non-symmetrical application with a high initial rate and a long time base. (Popkin-Arizona)
W72-00879

DATES IN ARIZONA,
Arizona Univ., Tucson. Agricultural Experiment Station.
H. F. Tate, and R. H. Hilgeman.
Bulletin A-22, June 1971. 32 p, 15 fig, 4 tab.

Descriptors: *Dates, *Crop production, *Climatic zones, *Planting management, *Arizona, Consumptive use, History, Arid lands, California, United States, Varieties, Curing, Winter, Temperature, Summer, Rainfall, Humidity, Harvest, Desert plants, Plant populations, Irrigation, Operation and Maintenance, Irrigation practices, Droughts, Plant growth regulators, Fruit crops, Plant diseases, Furrow irrigation, Hydration, Storage, Steam, Sprinkling.

A short history of dates in arid lands and Arizona is presented with climatic requirements, botany, variety, propagation, management, handling, curing, supplemental reading and operations schedule. Dates require moderate winter temperature, long hot summers, and little rainfall and low humidity during the harvest. The small desert area in Southern Arizona and California is the only region in the United States suitable for successful date culture. Date types and their soil adaptions are described. Irrigation management is an important balance between growth-retarding drought and fruit susceptibility to rain damage. Water is applied in furrows, to a soil depth of 6 to 8 feet. Hydration by storage, steam, cold storage and sprinkling is discussed. Many illustrations show growth stages and plant management practices. (Popkin-Arizona)
W72-00883

HERBICIDAL CONTROL OF ACACIA,
Agricultural Research Service, Beltsville, Md. Corps Research Div.
For primary bibliographic entry see Field 04A.
W72-00884

OBSERVATIONS OF SOVIET RUSSIA FARMS AND MARKETS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
J. S. Plaxico.
Oklahoma Current Farm Economics, Vol 44, No 1, p 5-11, March 1971. 6 ref.

Descriptors: *Farm management, *Cotton, *Crop production, *Irrigation practices, *Land reclamation, Farms, Farm units, United States, Prices, Evaporation, Arid lands, Irrigated land, Harvesting, Storage.
Identifiers: *USSR.

Observations include statistical comparison of number of farm acres, population involved in farming, number of tractors and trucks, and average size farm in Soviet Russia and the United States. Soviet farms are very large (Average 30,077 and 118,765 acres in 1967 for collective and state farms) and include diverse activities (education, health, culture, recreation, transportation, communication, housing). Markets and prices, farmer's markets, private plots, and the cotton industry are discussed. Cotton is a very successful crop; Soviet cotton is grown north of American cotton from May to October (145 days). Staple lint is longer than U.S. cotton. All Soviet cotton is irrigated by spray, sprinkler or surface application; underground watering is experimental, and promises to reduce significant evaporation. Reclamation of salty desert land to irrigated farms is discussed. Cotton harvesting and storage practices are outlined. (Popkin-Arizona)
W72-00885

INFILTRATION UNDER MOVING SPRINKLERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. M. Davisson.
Master of Science Thesis, March 1971. 91 p, 10 fig, 3 tab, 16 ref. OWRR B-039 COLO (1).

Descriptors: *Infiltration, *Sprinkler irrigation, *Rates of application, *Water conservation, *Irrigation efficiency, Water management (Applied), Design, Irrigation practices, Irrigation systems, Variability, Application methods, Infiltrometers, Experimental farms, Theoretical analysis, Drops (Fluids), Runoff, Frequency, Soils, Clays.

Infiltration information is provided here which will improve design and operation of moving sprinklers. Time-varying application rates, using a sprinkler infiltrometer, provide field data for analysis. A literature review of infiltration theory is presented. The effects of drop size, time, runoff on intake, sprinkler frequency, total infiltration depth, instantaneous application rate, time of application, and design are discussed. Drop size overshadowed all other variables in determining infiltration. Infiltration rate remains constant in a low range of time per pass of the sprinkler. Time per pass, runoff depth per pass, and instantaneous infiltration rule are highly interrelated because they contribute to the percentage of time that water is available for infiltration. A time-varying sprinkler application rate could improve irrigation efficiency and water conservation in heavy soils. (Popkin-Arizona)
W72-00886

REUSE OF SURFACE RUNOFF FROM FURROW IRRIGATION,
Oklahoma Univ., Stillwater. Dept. of Agricultural Engineering.
D. L. Pope.
Master of Science Thesis, May 1971. 79 p, 11 tab, 24 fig, 18 ref. OWRR A-021-OKLA (1).

Descriptors: *Water reuse, *Cost analysis, *Economic justification, *Time series analysis, *Runoff, Irrigation systems, Irrigation practices, Irrigation efficiency, Statistical methods, Furrow irrigation, Irrigated land, Experimental farms, Oklahoma, Plumes, Corn (Field), Sorghum, Hydrologic data, Distribution patterns, Pumping, Design, Overflow, Installation costs, Operation and maintenance, Crop production, Water conservation, Limiting factors, Groundwater, Hydrographs.

Reuse of surface runoff is an important part of an irrigation system. The amount and time distribution of surface runoff from furrow irrigation was determined for 6 irrigated fields in the Oklahoma Panhandle. Recording type H flumes gave a continuous runoff record. Corn or milo fields for row lengths of 1/4 and 1/2 mile were studied. Time series analysis was applied to the runoff data; runoff percentages were a long-normal time series. Runoff reuse can be obtained by cycling or continuous pumping. Designs can eliminate storage pit overflow. Total cost of installing and operating reuse systems is justified especially when value of potential crop production in limited groundwater areas is considered. Runoff hydrographs and cost analyses are presented. (Popkin-Arizona)
W72-00887

SOME PROJECTIONS FOR IRRIGATION IN THE CENTRAL BASIN OF THE OGALLALA FORMATION,
Oklahoma State Univ., Stillwater. Dept of Agricultural Economics.
V. R. Eidman.
Cimarron County Irrigation Association, Annual Meeting, Boise City, Agricultural Economics Paper 7105, 22 p, February 1971. 6 tab, 2 ref. OWRR B-010-OKLA (2).

Descriptors: *Irrigation practices, *Forecasting, *Economic prediction, *Water utilization, *Water management (Applied), Economic efficiency, Aquifers, Consumptive use, Implied benefits, Irrigated land, Irrigable land, Groundwater mining, Overdraft, Water table, Water level fluctuations, Crop production, Water transfer, Costs, Political aspects, Oklahoma, Education, Research and development.
Identifiers: *Ogallala Formation.

Changes in irrigation practices during the past 20 years, projections for irrigation and water use, and implications of these projections are presented for the Oklahoma panhandle. Water from the Ogallala Formation is the major source for irrigation. Irrigated acres increased from 10,000 to 117,000 from 1950 to 1965, and to 300,000 in 1969. Groundwater withdrawn increased from 17,000 to 178,000 acre feet from 1950 to 1965, and is currently being mined. Groundwater in the area is effected by groundwater in surrounding areas. Withdrawal rates are not spatially uniform. A general lowering of the water table is observed. Irrigable land is becoming available for expanded crop production and water consumption. Projections indicate that the average watertable drop will be 65 feet by 1990, when 6 million acre feet are consumed by crops. Since 23% of the irrigable land has 100 feet or less of saturated thickness, and for other reasons, a 65-foot decline will eliminate groundwater irrigation in 44% of the area. The community may not regulate water use because of questionable estimates, changes in irrigation practices, and water importation. Water-depletion trends are serious, irrigation practices will increase total water use, and importation is too costly for irrigation. Regulating water use is difficult because of no economic incentive, no simple political solution, and incomplete aquifer information. Continued education and research in this area is necessary. (Popkin-Arizona)
W72-00896

MOVEMENT OF WATER THROUGH FINE SANDY LOAM SOIL UNDER SUBIRRIGATION AND DRAINAGE CONDITIONS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W72-00897

SPATIAL DISTRIBUTION AND SUCCESSIONAL STATE OF GRASSLAND VEGETATION RELATED TO GRAZING INTENSITY TREATMENTS,
Wyoming Univ., Laramie. Plant Science Div.
For primary bibliographic entry see Field 02I.
W72-00898

PERFORMANCE OF A TWIN-WALL TRICKLE IRRIGATION HOSE,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
O. C. Wilke, and C. W. Wendt.
1971. 9 P, 6 FIG, OWRR B-080-TEX (1).

Descriptors: *Irrigation efficiency, *Furrow irrigation, *Orifice flow, Orifices, Pressure, Moisture tension, Flow rates, Return flow, Salinity, Conductivity, Germination.
Identifiers: Twin-wall trickle irrigation, Flow variability, Grapes, Cabbage, *Trickle irrigation.

A twin-wall trickle irrigation hose was tested from May through October on various plants, including grapes and cabbages. The hose was formed from black polyethylene sheets which were cut into strips, perforated, and heat welded. The outer layer orifice spacing was 18 in while inner-wall orifice spacings were 72 and 144 in. Average flow rates and flow variability was examined, and increasing pressure from 3 to 15 psi was found to decrease flow variability. Maintenance was minimal, and could be further decreased by strengthening the heat weld. Trickle irrigated and furrow irrigated plots of cabbage were studied. The trickle irrigated rows required 40% less water to maintain root zone soil moisture tension at or below 30 centibars. In addition, furrow irrigation concentrated salts in the top inch of the irrigated soil, while trickle irrigation moved salts from the beds to the furrows, a characteristic which should improve plant germination where salinity is a problem. (Lowry-Texas)
W72-00927

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08C.
W72-00571

FLOOD PLAIN INFORMATION, RED CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.
Corps of Engineers, Philadelphia, Pa.

Flood Plain Report, February 1972. 39 p, 6 fig, 13 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Delaware, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (New Castle County Del), Standard Project Flood, Intermediate Regional Flood.

Flooding along Red Clay Creek from its confluence with White Clay Creek south of Stanton, Delaware, upstream to the Pennsylvania-Delaware State line near Yorklyn Delaware is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future and based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest recorded flood in the study area occurred on Sep. 12, 1960 and resulted from Hurricane 'Donna'. This storm moved northward off

the coast of New Jersey causing high winds and heavy rainfall (6-8 inches). This flood reached an elevation of 91.39 feet, mean sea level datum, at the Wooddale gage. The Intermediate Regional Flood would reach an elevation of 95.0 feet, m.s.l.datum, at the Wooddale gage and the Standard Project Flood, 98.79 feet. (Woodard-USGS)
W72-00591

FLOOD PLAIN INFORMATION, CHEHALIS, WISHKAH AND HOQUIAM RIVERS, ABERDEEN-HOQUIAM-COSMOPOLIS, WASHINGTON.
Corps of Engineers, Seattle, Wash.

Flood Plain Report, June 1971. 39 p, 15 fig, 12 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Washington, Regional flood, Flood forecasting, Flood control, Peak discharge, Historic flood.
Identifiers: Standard project flood, Intermediate regional flood.

Flooding along the Chehalis, Wishkah, and Hoquiam Rivers in the cities of Aberdeen, Hoquiam and Cosmopolis, Washington is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extend of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The discharge estimates for the Standard Project Flood for Chehalis River at the mouth is 115,000 cfs; Wishkah River at the mouth is 22,900 cfs; and Hoquiam River at the mouth is 16,700 cfs. The largest known flood in the study area occurred in December 1933. Rainfall (35.7 inches in Aberdeen) during the entire month was of record proportion. (Woodard-USGS)
W72-00592

CHANGES IN SALINITY IN THE DELTA AREA OF THE RIVERS RHINE AND MEUSE RESULTING FROM THE CONSTRUCTION OF A NUMBER OF ENCLOSING DAMS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
R. Peelen.
Neth J Sea Res. 5 (1): 1-19. Illus. Maps. 1970.
Identifiers: Construction, Dams, Delta, Enclosing, Meuse, Netherlands, Number, Rhine, Rivers, Salinity.

Salinity in the northern part of the Delta area of Rhine and Meuse is discussed. The initial situation, prior to realization of the Delta Plan, the successive influences of the construction of the dam forming part of the bridge over the Haringvliet and the construction of the Grevelingen dam are described. Isohalines have been drawn depicting the situation in the surface water during 6 phases of the tidal cycle. The isohalines of the water near the bottom at low and high tide, are shown on 2 charts. The consequences of the closure of the Volkerak dam are discussed.--Copyright 1971, Biological Abstracts, Inc.
W72-00712

MATHEMATICAL MODELING OF WATER DISTRIBUTION SYSTEMS,
General Electric Company, Philadelphia, Pa. Reentry and Environmental Systems Div.
H. D. Gilman, M. Y. Goodman, and R. V. Metkowski.
Available from the National Technical Information Service, as PB-204 116, paper copy $3.00, microfiche $0.95. General Electric Technical Information Series Document No. 71SD241, July 1971. 241 p, 12 fig, 10 tab, 49 ref, 2 append. OWRR C-1725 (3162) (1).

Descriptors: *Water distribution, *Automatic control, *Simulation, Networks, *Mathematical models, Computer programs, Model studies, *Network design, *Control systems, Pipe flow, *Distribution systems.
Identifiers: Network analysis, Control guidelines, Hardy cross, Inverse solution.

The major objective of this research was to develop a model suitable for simulation and study of real-time control of typical water distribution systems and eventual implementation in a process control computer. A unique approach was developed using an 'inverse solution' to track flow conditions in the field using a limited number of pressure and flow measurements. It uses a network model to iteratively adjust pipe flows to force agreement between calculated and measured pressures; total demand for the model is fixed by the measured pump and tank flows. The model is then used to simulate and evaluate the application of various control alternatives. A demonstration test case was run showing how this approach can be used to control pressure by turning available pumps on/off. The study also included a literature survey, convergence acceleration methods for calculating a network balance, sensitivity of the 'inverse solution' to model data uncertainties, and a compilation of guidelines for water distribution control. IBM 360 Fortran IV source program listings, sample test cases and instructions for using the program are included.
W72-00715

SCS NATIONAL ENGINEERING HANDBOOK, SECTION 4, HYDROLOGY,
Soil Conservation Service, Washington, D. C. Hydrology Branch.
Victor Mockus.
Available from GPO, Washington, D.C. 20402-Price $5.75. Soil Conservation Service Engineering Handbook, Section 4, Hydrology, 1971 revision. 544 p, 149 fig, 84 tab.

Descriptors: *Publications, *Manuals, *Design standards, *Methodology, Hydrologic properties, Watershed management, Project planning, Appraisals, Land use, Water conservation, Agricultural engineering, Soil conservation, Flood control, Flood routing, Storm runoff.
Identifiers: *SCS engineering handbook, Hydrologic procedures.

This is the fourth issue of a handbook first issued in 1954 under the title 'Hydrology guide for use in watershed planning.' Chapters 14, 15 and 16 are revised additions to the handbook and Chapters 11, 12, 13, 18, 19, 20 and 22 are reprints with an updated format for several sections. Names of persons primarily responsible for the development of procedures and the content of individual chapters are identified with their respective chapters for future reference to inquiries, later revisions, and for appropriate credit. Among the topics discussed in the 22 chapters are the following: storm rainfall and streamflow data, hydrologic soil groups, hydrologic effects of land use and treatment, stage-inundation relationships, flood routing, traveltime, time of concentration, transmission losses, watershed yield, and design hydrographs. A glossary and a table of conversion factors are included. This handbook contains some new techniques developed to meet specific needs of SCS. Hydrologic theory is held to the minimum necessary to show methods not readily available elsewhere. Hydrologic literature references are given if they provide additional theory, data, discussion, or details of a method. Each major hydrologic problem type is discussed, alternative solutions are given where possible and their relative merits considered. (Lang-USGS)
W72-00792

RESERVOIRS OF HYDROELECTRIC POWER PLANTS OF THE USSR (VODOKHRANILISHCHA GIDROELEKTROSTANTSIY SSSR),
A. B. Avakyan, and V. A. Sharapov.
Izdatel'stvo 'Energiya,' Moscow, 1968. 384 p.

Descriptors: *Reservoirs, *Reservoir operation, *Water management (Applied), *Hydroelectric plants, Hydroelectric power, Regulation, Dams, Banks, Discharge (Water), Water levels, Sediments, Groundwater, Flood control, Engineering, Navigation, Forest management, Fish management, Water supply, Water resources, Economics.
Identifiers: *USSR, Rybinsk Reservoir, Kuybyshev Reservoir, Tsimlyansk Reservoir, Volgograd Reservoir, Bratsk Reservoir, Krasnoyarsk Reservoir, Kremenchug Reservoir, Hydropower, Pisciculture.

Reservoirs of hydroelectric power plants of the USSR are described in terms of their importance to various fields relating to water, including agriculture, biology, chemistry, city planning, climatology, forestry, pisciculture, navigation, and many branches of engineering such as hydraulic irrigation, flood-control, hydropower, sanitary, and water-resources engineering. The changes introduced into the economic life of regions by the reservoirs were examined to plan the relocation of existing structures and the clearing of reservoir basins. Five classes of reservoirs based on location were identified: (1) reservoirs of lowlands and plains; (2) reservoirs of piedmonts and plateaus; (3) mountain reservoirs; (4) lake reservoirs; and (5) borrow pits. The total number of reservoirs in the USSR as of January 1, 1967 was 113, of which 85 were in operation and 28 under construction. The geographical distribution of these reservoirs was as follows: 83 in the European USSR, 14 in Transcaucasia, 13 in Central Asia and Kazakhstan, and 3 in Eastern Siberia. Three-fourths of the total water-surface area and two-thirds of the effective storage of the reservoirs of operating power plants were located in the Volga-Kama, Yenisey-Angara, and Neva River basins. Excluding the Caspian and Aral Seas, the reservoir areas of the USSR constitute about one-fourth of the area of inland water surfaces and will, in the next 15-25 years, exceed the surface area of the inland waterways. Twenty-six of the 113 reservoirs presently in operation or under construction have a water-surface area exceeding 1,000 sq km. (Josefson-USGS)
W72-00814

THE PROPER PRACTICE OF SYSTEMS ANALYSIS.
Purdue Univ., Lafayette, Ind. School of Engineering.
For primary bibliographic entry see Field 06A.
W72-00853

ECONOMIC DEVELOPMENT OF AREAS CONTIGUOUS TO MULTIPURPOSE RESERVOIRS: THE KENTUCKY-TENNESSEE EXPERIENCE,
Kentucky Univ., Lexington. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W72-00863

HERBICIDAL CONTROL OF ACACIA,
Agricultural Research Service, Beltsville, Md. Corps Research Div.
A. J. Oakes.
Turrialba. Revista Interamericana de Ciencias Agricolas, Vol 20, No 2, p 213-216, April-June 1970. 4 tab, 6 ref.

Descriptors: *Herbicides, *Weed control, *Chaparral, *Desert plants, *Application methods, Rate of application, Pastures, Plant growth, Reproduction, Competition, Drought tolerance, Pest control, Elevation, Wet seasons, Dry seasons, Experimental farms, Foliar applications, Sprays, Carriers, 2-4-D, 2-4-5-T, Virgin Islands, Arid lands.
Identifiers: *Acacia, *Noxious weeds, Basal spray.

Acacia, a thorny chaparral, is a major pasture problem throughout the Virgin Islands. Its gregarious growth, high reproductive capacity, competitiveness, and drought tolerance makes it a pasture pest at low to middle elevations and dry to moderate rainbelts. Alternating wet and dry seasons characterize the Islands. Field tests were established for herbicidal control of A. macracatha

and A. tortuosa, two particularly noxious weeds. Herbicides were applied by basal-pour, basal spray and foliar spray, with water, oil-water, and oil carriers. Low olatile ester formulations of (2-4-D) acetic acid, (2-4-D), and (2-4,5-T) acetic acid, (2-4,5-T) were superior to other herbicides. Herbicides were most effectively applied as basal spray in diesel oil. One yearly application is sufficient for weed control after initial applications. (Popkin-Arizona)
W72-00884

SYMPOSIUM ON ENGINEERING WITH NUCLEAR EXPLOSIVES.
American Nuclear Society, Washington, D.C.; and Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-00966

PROJECT AQUARIUS--GEOHYDROLOGIC INVESTIGATION,
Arizona Univ., Tuscon.
For primary bibliographic entry see Field 08H.
W72-00971

GULF INTRACOASTAL WATERWAY PROJECT, CARRABELLE TO ST. MARKS RIVER, FLA.
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-199 887, $3.00 in paper copy, $0.95 in microfiche. Draft environmental statement 10 Jun 71. 16 p.

Descriptors: *Environmental effects, *Inland waterways, *Dredging, *Channel improvements, *Navigation, Waste disposal, Sedimentation.
Identifiers: *Gulf Intracoastal Waterway, *Environmental impact statements, *Alligator Harbor, Franklin County (Florida), Wakulla County (Florida).

The action consists extending the 12-foot Gulf Intracoastal Waterway via St. George Sound, Alligator Harbor, a land cut across St. James Island and Ochlockonee and Apalachee Bays to the Mouth of St. Marks River, located in Franklin and Wakulla Counties, Florida. This project will provide a more direct and less hazardous route for barge traffic between Carrabelle and St. Marks, Florida. Channelization will be by hydraulic dredge methods. Spoil will be placed in open water off Alligator Point (Peninsula Point) and on fast land within diked areas adjacent to the land cut across St. James Island. Short term adverse effects to some grass beds due to increased turbidities and silt generated during construction. Less saline water will be diverted by the land cut into Alligator Harbor.
W72-01120

4B. Groundwater Management

GROUND-WATER CONDITIONS DURING 1969-VANDENBERG AIR FORCE BASE AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. H. Koehler.
Geological Survey Open-file Report, March 26, 1971. 19 p, 5 fig, 5 tab, 5 ref.

Descriptors: *Water supply, *Groundwater, *Water wells, *Hydrogeology, *California, Water yield, Water quality, Chemical analysis, Groundwater recharge, Water users, Aquifer characteristics, Withdrawal.
Identifiers: *Vandenberg Air Force Base (Calif).

The water supply for Vandenberg Air Force Base in California is obtained from wells in the Lompoc plain, Lompoc terrace, and San Antonio Valley groundwater basins. About 4,960 acre-feet of water was pumped from the supply wells during the 1969 calendar year, which is about 830 acre-feet less than was pumped the previous year. Because of the recharge that occurred with the abnormally high rainfall in January and February, the water level in many of the wells rose in 1969. Several chemical constituents including dissolved solids, iron, manganese, sulfate, and chloride, in the water from the Lompoc plain wells exceed the limits recommended by the U.S. Public Health Service. The quality and quantity of water in the San Antonio Valley are adequate for further development of the well field. (Woodard-USGS)
W72-00593

TIDES IN CONFINED WELL-AQUIFER SYSTEMS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geological Sciences.
E. S. Robinson, and R. T. Bell.
Journal of Geophysical Research, Vol 76, No 8, p 1857-1869, March 10, 1971. 14 fig, 5 tab, 18 ref. OWRR A-023-VA (2).

Descriptors: *Water level fluctuations, *Groundwater, *Water wells, *Tidal effects, *Virginia, Aquifers, Porosity, Storage capacity, Mathematical studies, Equations.

Tidal water-level fluctuations were recorded in ten observation wells in Virginia. Six wells are located on the Atlantic Coastal Plain, and four are in the Appalachian Mountain region. A quantitative explanation of the observed well tides is developed from consideration of the tidal dilatation of an idealized well-aquifer system. The response of a confined well-aquifer system to tidal dilatations requires consideration of the earth tidal dilatation, the barometric tidal dilatation, and the ocean tide dilatation as expressed by equations. For wells located far inland, the ocean tide dilatation can be neglected. For wells located near the ocean the explanation of tides requires analysis of at least two tidal harmonic constituents and the ratio of the heights of the corresponding ocean tide constituents. The magnitudes of the ocean tide dilatations can be eliminated in solving the equations, but their ratio must be known. (Woodard-USGS).
W72-00598

WATER RESOURCES OF SALT LAKE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
A. G. Hely, R. W. Mower, and C. A. Harr.
Utah Department of Natural Resources Technical Publication 31, 1971. 244 p, 94 fig, 43 tab, 124 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Great Salt Lake, *Utah, Water yield, Water quality, Precipitation (Atmospheric), Runoff, Groundwater recharge, Hydrologic budget, Aquifers, Water wells, Water supply, Evaporation, Chemical analysis, Water chemistry, Streamflow, Lakes, Water level fluctuations, Water balance, Hydrogeology.
Identifiers: *Salt Lake County (Utah).

Large quantities of usable water are discharged to Great Salt Lake and are lost every year by evapotranspiration of groundwater in low-lying areas of Salt Lake County, Utah. Among the factors responsible for this situation are (1) lack of storage capacity to regulate runoff from the Wasatch Range within the county, (2) legal attitudes prior to 1969 that tended to limit groundwater development, (3) lack of coordination of withdrawals from surface and subsurface sources, and (4) lack of knowledge about the hydrologic effects of withdrawals of groundwater. During the water years 1964-68, the mean annual surface inflow to Jordan Valley, the principal populated area of Salt Lake County, was 463,000 acre-feet; and the outflow, discharged to Great Salt Lake, was 324,000 acre-feet. Approximately half the inflow was suitable for municipal and most industrial uses with a dissolved-solids content generally less than 500 mg/liter. The other half, which was not suitable for municipal use because of poor chemical and sanitary quality, was the principal supply for irrigation and those industrial uses without stringent quality requirements. The chemical quality of the groundwater varies markedly. Water from the principal aquifer in most of Jordan Valley is suitable for municipal use, irrigation, and most industrial uses; but water from the northern part of the valley near Great Salt Lake is suitable only for uses without stringent quality requirements. (Woodard-USGS)
W72-00788

RECONNAISSANCE OF SEA-WATER INTRUSION ALONG COASTAL WASHINGTON, 1966--68,
Geological Survey Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-00789

LOGS OF WELLS IN CAMPBELL COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 07C.
W72-00795

RESIDUAL SALINIZATION OF VIRGIN SOILS AND GROUNDWATER IN THE SOUTHWESTERN PART OF THE GOLODNAYA STEEPE (OSTATOCHNOYE ZASOLENIYE TSELINNYKH POCHV I GRUNTOVYKH VOD YUGO-ZAPADNOY CHASTI GOLODNOY STEPI),
Central Asian State Inst. for the Design and Planning of Irrigation Structures and Rural Electric Powerplants, Tashkent (USSR).
For primary bibliographic entry see Field 03C.
W72-00806

INTERTEMPORAL ALLOCATION OF GROUND WATER IN THE CENTRAL OGALLALA FORMATION: AN APPLICATION OF A MULTISTAGE SEQUENTIAL DECISION MODEL,
Haile Sellassie I Univ., Alem Maya (Ethopia). Dept. of Economics; and Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 02F.
W72-00889

SOME PROJECTIONS FOR IRRIGATION IN THE CENTRAL BASIN OF THE OGALLALA FORMATION,
Oklahoma State Univ., Stillwater. Dept of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W72-00896

NUCLEAR EXPLOSIVES IN WATER--RESOURCE MANAGEMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-00969

4C. Effects on Water of Man's Non-Water Activities

REVISED OBJECTIVES FOR DESIGN OF URBAN STORMWATER SYSTEMS IN THE PUGET SOUND REGION,
Washington Univ., Seattle. Inst. of Forest Resources.
For primary bibliographic entry see Field 05G.
W72-00797

VARIATION OF URBAN RUNOFF WITH DURATION AND INTENSITY OF STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.

D. M. Wells, T. A. Austin, and B. C. Cook.
Available from the National Technical Information Service as PB-204 235, $3.00 in paper copy, $0.95 in microfiche. Texas Tech University Water Resources Center Project Completion Report WRC-71-5 (ICASALS Special Report No 47) August 1971. 30 fig, 24 tab, 37 ref, 2 append. OWRR B-064-TEX (1).

Descriptors: *Rainfall-runoff relationships, *Storm runoff, *Cities, *Routing, *Mathematical models, Systems analysis, Texas, Urbanization, Stochastic processes, Markov processes, Statistical models, Simulation analysis, Model studies, Duration curves, Monte Carlo method, Depth-area-duration analysis.
Identifiers: *Urban hydrology, Road Research Laboratory method.

A simulation model describes the quantitative and qualitative regimes of storm water runoff from urban watersheds. The urban runoff system consists of three basic subsystems: Precipitation, runoff, and quality. Each of the three subsystems is mathematically modeled using probability and statistical techniques. Major flooding in the High Plains of Texas is associated with short-duration high-intensity convective storms. The model assumes these short-duration precipitation events are random and governed by a stationary probability distribution function. A bivariate log-normal distribution function fits the observed rainfall depths and durations for Lubbock, Texas. The runoff process is modeled by using the British Road Research Laboratory method, which assumes that all runoff is derived from interconnected impervious areas. Rainfall inputs are simulated by the Monte Carlo method. The outflow hydrograph is generated by single-step reservoir routing. The total pollutant load is predicted by a multiple regression involving the storm characteristics and the antecedent conditions. A one-step lag regression model is used to predict the pollutant concentrations. (Knapp-USGS)
W72-00816

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF SPORT AND COMMERCIAL FISHERIES SUBPROJECT,
Idaho Cooperative Fishery Unit, Moscow. Fish and Game Dept.
For primary bibliographic entry see Field 06B.
W72-00875

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF HISTORY SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research inst.
For primary bibliographic entry see Field 06B.
W72-00876

4D. Watershed Protection

SURFACE RUNOFF AND SOIL EROSION ON EXPERIMENTAL CATCHMENTS, (IN RUSSIAN),
M. B. Doshchanov, and K. Tashpulatov.
Tr Tashkent Selskokhoz Inst. 20. 187-192. 1968.
Identifiers: Catchments, Erosion, Forestation, Re, Runoff, Soil, Surface, Terracing, USSR.

Terracing and afforestation of the catchments of mountain rivers considerably reduced surface runoff (the runoff modulus was reduced to 1/2-2/3) and influenced its transformation into subsurface runoff, eliminating soil erosion and reducing solid runoff to 1/50-1/10. The investigations were carried out in the basins of the Sukok River tributaries.--Copyright 1971, Biological Abstracts, Inc.
W72-00673

SCS NATIONAL ENGINEERING HANDBOOK, SECTION 4, HYDROLOGY,
Soil Conservation Service, Washington, D. C. Hydrology Branch.
For primary bibliographic entry see Field 04A.
W72-00792

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

RECOGNITION OF CRUDE OILS BY CAPILLARY GAS CHROMATOGRAPHY,
Esso Research Centre, Abingdon (England).
R. D. Cole.
Nature, Vol 233, No 5321, p 546-548, October 22, 1971. 2 fig, 1 tab, 8 ref.

Descriptors: *Water pollution sources, *Pollutant identification, *Oily water, *Gas chromatography, Analytical techniques, Surface waters, Oceans, Ships, Oil wastes, Oil industry.
Identifiers: *Oil spills.

A method of identifying the origin of spilled crude oil using capillary column gas chromatography is proposed. Work with 25 fresh crude oils demonstrates that oils from different continents yield very different chromatograms, and that there are also significant differences between the chromatograms of oils from neighboring fields in the Middle East and North Africa. The three types of persistent oil likely to be spilled at sea are fuel oil, fresh crude oil and crude oil residues from tank cleaning; it is possible to differentiate between them by examining their wax and asphaltenes contents, and their volatility profiles as indicated by gas chromatography. The technique described could probably be applied to each of these oils to help trace its source, but it has so far been confined to crude oils. (Woodard-USGS)
W72-00573

ASSESSMENT OF SURFACE WATER QUALITY BY A SINGLE INDEX OF POLLUTION,
Ferrara Univ. (Italy). Istituto di Igiene.
L. Prati, R. Pavanello, and F. Pesarin.
Water Research, Vol 5, No 9, p 741-751, September 1971. 10 fig, 3 tab, 10 ref.

Descriptors: *Water quality, *Surface waters, *Water pollution sources, *Numerical analysis, *Pollutant identification, Pollutants, Indicators, Water quality control, Mathematical studies, Chemical analysis, Hydrologic data.
Identifiers: *Water quality (Mathematical expressions).

The identification of an 'implicit index of pollution' based on river water quality classification is described. The index is a numerical expression of the degree of pollution and takes into account the various pollutants present at the same time (though measured separately). This index, increasing with the degree of pollution, could be used for the numerical evaluation of a purely qualitative characteristic expressed by the term 'pollution'. The objective was to determine as many mathematical expressions as there are pollutants, to transform concentrations into levels of pollution expressed in new units which would then be the 'units of measurement of pollution'. These mathematical expressions are so constructed for each polluting factor, that their numerical value is no longer proportional to the concentration but to the 'polluting effect' relative to other factors. In this way, although one pollutant may be present in smaller concentrations than another, it will have a large number if its polluting effect is greater. (Woodard-USGS)
W72-00577

WATER-SOLUBLE N03-NITROGEN, PO4--PHOSPHORUS, AND TOTAL SALT BALANCES ON A LARGE IRRIGATION TRACT,
Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center.
For primary bibliographic entry see Field 05B.
W72-00597

HYGIENIC STANDARDIZATION OF BISMUTH IN WATER BODIES (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Sverdlovsk (USSR).
For primary bibliographic entry see Field 05C.
W72-00651

EXPERIMENTAL SUBSTANTIATION OF THE PERMISSIBLE CONTENT OF DIANATE AND 2,3,6-TRICHLORBENZOIC ACID IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 05C.
W72-00653

USE OF THE METHOD OF DIRECT BACTERIAL COUNT IN THE STUDY OF THE SELF-PURIFICATION OF UNDERGROUND WATERS, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 05B.
W72-00654

TRACE ELEMENT REMOVAL FROM SEWAGE EFFLUENT BY SOIL FILTRATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 05D.
W72-00659

THE ROLE OF MICROORGANISMS GROWING ON OIL IN THE SELF-CLEANING AND INDICATION OF OIL POLLUTION IN THE SEA, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05G.
W72-00709

BIOASSAYS TO DETERMINE ALGAL GROWTH POTENTIAL OF MICRONUTRIENTS,
Washington State Univ., Pullman. Water Research Center.
For primary bibliographic entry see Field 05C.
W72-00801

VARIATIONS IN THE NUTRIENT CONTENT OF SUSPENDED SEDIMENTS IN RIVERS OF CENTRAL ASIA AND SOUTHERN KAZAKHSTAN (NEKOTORYYE ZAKONOMERNOSTI SODERZHANIYA PITATEL'NYKH ELEMENTOV VO VZVESHENNYKH NANOSAKH SREDNEAZIATSKIKH I YUZHNOKAZAKHSTANSKIKH REK),
Akademiya Nauk SSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02J.
W72-00808

POLARIZING MICROSCOPE IDENTIFIES WATER-FORMED DEPOSITS,
Calgon Corp., Pittsburgh, Pa.
P. M. Colacito.

Descriptors: *Analytical techniques, *Microscopy, *X-ray spectroscopy, *Corrosion, *Chemical-precipitation, Water chemistry, Methodology, Laboratory tests, Optical properties, Water analysis, Organic matter, Zeolites, Calcite, Silica.
Identifiers: *Water formed deposits, Polarizing microscope, Water treatment technology.

A description is given of how one laboratory uses microscopy combined with spectroscopic and X-ray techniques for positive analysis of water-formed deposits and corrosion products. Identification of such deposits is a necessary prerequisite for successful water treatment technology. Infrared is used chiefly to identify organic materials and as a supplementary tool for the microscopist. Wet chemical and atomic absorption methods give quantitative elemental composition. Emission spectrographic, X-ray diffraction, and microscopic techniques complement each other and yield maximum information about the mineral composition of a deposit both quickly and economically. Examples are given to show the utility of the microscope when instant analysis is required. A drawing shows the steps involved in microscopic analysis. Tables show different chemical compounds identified by microscope and X-ray in typical water-formed deposits and results of water-deposit analysis made by different techniques. (Lang-USGS)
W72-00828

A RAPID METHOD FOR THE ESTIMATION OF THE CARBON CONTENT OF SESTON AND PERIPHYTON,
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
Richard, Armstrong, Charles R. Goldman, and Dennis K. Fujita.
Limnology and Oceanography, Vol 16, No 1, p 137-139, 1971. 2 fig, 1 tab.

Descriptors: *Measurement, *Carbon, *Periphyton, *Seston, Analytical techniques, California.
Identifiers: Infrared analyzer, Induction furnace, Castle Lake (Calif), Lake Tahoe (Calif).

This method utilizes combustion of samples in an induction furnace, a process bringing about rapid random movement of electrons in a conductor. Following combustion, microgram amounts of organic carbon in seston and periphyton samples are determined with an infrared analyzer. Results of duplicate sample determinations of seston usually agreed within 10%, those of periphyton within 20%. (Wilde-Wisconsin)
W72-00837

A PH-CARBON DIOXIDE METHOD FOR MEASURING AQUATIC PRIMARY PRODUCTIVITY,
Georgia Univ., Athens. Inst. of Ecology; and Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-00841

LABORATORY TESTS FOR PLANT OPERATION CONTROL AND STREAM QUALITY MEASUREMENT,
Delaware Univ., Newark. Dept. of Civil Engineering.
Shankha K. Banerji.
Journal Water Pollution Control Federation, Vol 43, No 3, p 399-406, 1971. 35 ref.

Descriptors: *Sewage treatment, *Water pollution control, *Laboratory tests, *Measurement, Water analysis, Biochemical oxygen demand, Water quality, Analysis, Chemical oxygen demand, Oxidation-reduction potential, Analytical techniques, Tests, Sludge.
Identifiers: Sewage treatment plants, Total organic carbon, Total oxygen demand, Suspended solids, Mixed liquor suspended solids, Sludge volume index.

A critical evaluation is made of current analyses used in appraisal of wastewater and stream waters. The time-consuming 5-day BOD test is likely to be replaced by the rapid total carbon, COD and TOD tests. For activated sludge MLSS test appears to be better suited than the SS test. Determination of active biomass by the organic N, DNA, or dehydrogenase methods is more complicated than MLVSS determinations. SVI test is of questionable value because of its dependence on many uncontrollable variables. ORP analysis provides erratic results due to unpredictable complex reactions. Appraisals of stream water quality requires consideration of the mixing of effluent discharge system aside from the chemical and biological analyses. (Wilde-Wisconsin)
W72-00849

COOPERATIVE INVESTIGATIONS--II. KNOWLEDGE OF SURFACE WATER QUALITY IMPORTANT TO WATER DEVELOPMENT BOARD,
Texas State Water Development Board, Austin.
H. M. Cook, and G. D. Laneman.
Water for Texas, p 8-10, January 1971. 1 tab.

Descriptors: *Water quality, *Sites, *Sampling, *Data collections, *Water pollution sources, Stream flow, Water analysis, Chemical analysis, Inorganic compounds, Pesticides, Mathematical models, Estuaries, Basins, Saline water systems.
Identifiers: Texas Water Development Board, U.S. Gedological Survey.

The surface water quality data collecting network for Texas is described as a cooperative program between the Texas Water Development Board, U.S. Geological Survey, and local interests. There are 132 sampling sites for continuous or daily records, 92 sites for inorganic chemical data, and 111 sites for pesticide data. Natural and man-made pollution is discussed with the history of the $884,224 sampling program. Mathematical models of estuaries and specific saline-water and basin studies are noted. (Popkin-Arizona)
W72-00881

SPENT SULFITE LIQUOR-THE VANILLIN METHOD FOR ESTIMATION OF THE CONCENTRATION OF SPENT SULFITE LIQUIR IN WATERS,
Washington Univ., Seattle. Coll. of Forest Resources.
B. F. Hrutfiord, J. L. McCarthy, and P. Y. Jone.
Technical Association of the Pulp and Paper Industry, Vol 53, No 9, p 1746-1749, Sept 1970. 2 fig, 2 tab, 19 ref.

Descriptors: Water pollution sources, *Sulfite liquor, Lignins, *Gas chromatography, Chemical reaction, Laboratory tests, *Pollutant identification, Analytical techniques.
Identifiers: Vanillin, Alkaline hydrolysis.

The Pearl-Benson (PBI) procedure for measuring the concentration of spent sulfite liquor in water is not specific for spent sulfite liquor. A 'vanillin' method for estimating the concentration of spent sulfite liquor in waters is described which is specific for sulfite. A sample of water, fresh or salt, is first extracted with chloroform to remove interences. The sample is then subjected to alkaline hydrolysis. After cooling and acidification, the vanillin thus formed is extracted with dichloromethane, treated with a silylation reagent, and then measured quantitatively by gas chromatography using eugenol as an internal standard. Spent sulfite liquor concentration is related to the determined vanillin by the use of a calibration curve. The procedure is found to give moderately reproducible results down to a concentration of a few parts of spent sulfite liquor (containing 10% solids) per million parts of water sample. Because vanillin is formed almost uniquely by alkaline hydrolysis from the lignin sulfonates present in spent sulfite liquor, the method should be useful in special cases where it is important to confirm the presence or absence and the concentration of spent sulfite liquor. For routine estimations of spent sulfite liquor concentration, however, the Pearl-Benson nitroso method is more appropriate. (Goessling-Texas)
W72-00900

SECOND ORDER AND FIRST ORDER KINETICS FOR BOD DATA,
New Brunswick Univ., Fredericton.
R. C. Landine.
Water and Sewage Works, Vol 118, Ref No. 1971, p R/45-R/53, 4 fig, 2 tab, 29 ref.

Descriptors: *Biochemical oxygen demand, *Kinetics, *Water analysis, Sampling, Chemical oxygen demand, Data collections, Waste water treatment, Pollutant identification.
Identifiers: *Organic carbon.

The use of theoretical first or second order equation to describe BOD progression was examined. A variety of complicating factors was discovered for both cases to such an extent that it was determined to be impossible to formulate a theoretical BOD curve, and it was established that empirical equations must be resorted to. Several long term BOD tests were then conducted to provide data for analysis and the formulation of empirical equations. Incubation periods of from one and one-half to three months were used at temperatures ranging from .5 deg. C to 20 deg. C. BOD measurements were made by respirometer standard dilution, jug dilution and cylinder method in some instances. Both first and second order kinetics were applied to the data. Calculated kl values depended on data time sequence, measurement method, and substrate concentration, but no consistent temperature relationship was observed. Linear BOD curves could only be represented by a second order relationship. Use of the second order sequence allowed computer calculation of the constants. However, data points were amenable to either equation as long as the system was non-linear. Greater use of the organic carbon and COD tests is recommended since they permit evaluation of the ultimate value at time zero. (Lowry-Texas)
W72-00911

A MOBILE LABORATORY FOR FOOD PROCESSING WASTEWATER ANALYSES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
Michael R. Soderquist, and Dennis W. Taylor.
American Society of Agricultural Engineers, Paper No 71-418, Oregon Agricultural Experiment Station Technical Paper No 3121, June 1971. 23 p, 3 fig, 6 tab, 13 ref.

Descriptors: *Canneries, *Laboratory tests, Research facilities, Sampling, Refrigeration, Storage, Instrumentation, Analytical techniques, Data collection, *Water analysis, Oregon, Pollutant identification.
Identifiers: *Mobile laboratories, *Food processing wastes.

A comprehensive literature review and state-wide processor survey indicated that most of the available data on food processing waste streams was inappropriate for serious research usage. Since comprehensive, reliable wastewater characterization is a necessary prerequisite to studies of waste treatment and utilization and by-product development, a mobile laboratory was constructed to gather usable comprehensive wastewater quantity and quality profiles for each of the major commodity-process combinations in Oregon. A fifteen foot long commercial travel trailer was selected for use. All analyses to be performed in the trailer were enumerated and all supplies listed. A description of the interior of the laboratory as used throughout the summer of 1970 is included. Delicate balances were not adaptable to use in the trailer, even when placed on jacks. To alleviate this problem, all subsequent sensitive work involving weighing will be performed at a permanent base facility. Both power and water limitations troubled the labs personnel, with not enough current carrying capacity in the electrical system and not enough water faucets. Despite these and other difficulties, reliable data were generated and future projects are planned. (Lowry-Texas)
W72-00912

NUTRIENT DIGESTIBILITY USING FECAL COLLECTION APPARATUS AND INDICATOR METHOD FOR STEERS FED AD LIBITUM,
Kentucky Univ., Lexington.

P. A. Phar, N. W. Bradley, C. O. Little, L. V. Cundiff, and J. A. Boling.
Journal of Animal Science, Vol 33, No 3, p 695-697, September 1971. 4 tab, 12 ref.

Descriptors: *Digestion, *Nutrients, Analytical techniques, Animal waste, Confinement pens, Cattle.
Identifiers: *Chromic oxide indicator, *Fecal collection apparatus, Pelleted ration, Ad libitum, Feed trial, Crude protein, Crude fiber, Ether extract, Gross energy coefficient, Steer.

Six 2-year-old steers weighing an average of 453 kg were randomly assigned to a cross-over design to study the effects of fecal collection apparatus on the apparent digestibility of nutrients when a complete, pelleted ration was fed ad libitum and to compare total collection versus chromic oxide indicator coefficients. Chromic oxide was mixed with the ration prior to pelleting at the rate of 0.5%. Fecal samples were taken twice during a 24-hr. period and composited at the end of the 6-day collection period for each steer. Sampling times representing each 2-hr. interval were randomly assigned to days. Average daily feed intake was not significantly affected by fecal collection apparatus. There was no significant difference in crude protein, crude fiber, ether extract, N.F.E. or gross energy coefficients calculated by the conventional and indicator methods; however, there was a significantly (PA.01) lower dry matter coefficient when calculated by indicator method. When the indicator method of estimating digestibility was used to compare the effect of collection apparatus versus no apparatus on digestibility of nutrients, the N.F.E. digestibility was significantly (PA.05) lower in the steers without the fecal collection apparatus. Coefficients of digestibility for dry matter, crude protein, crude fiber, ether extract and gross energy were not significantly (PS.05) affected by fecal collection apparatus. (Bundy-Iowa State)
W72-00982

IDENTIFICATION OF FEEDLOT ODORS,
California Univ., Riverside. Statewide Air Pollution Research Center.
J. Fosnaugh, and E. R. Stephens.
Statewide Air Pollution Research Center (final report), Grant No U100531-02, p 1-24, April 30, 1969. 3 fig, 2 ref.

Descriptors: *Chromatography, Ionization, Laboratory tests, *Odors, Chemical analysis, *Farm waste, Organic compounds, Cattle, *Pollutant identification.
Identifiers: *Feedlot odors, Field analyzing technique, Ambient concentration, Ionization detector, Trimethylamine, Amines.

The proximity of cattle feedlots to suburban housing has created local air pollution problems which in some instances have forced feedlots to cease operation or to move. The principal objective of this project was to identify the odorant compounds and to develop methods for their detection and measurement. Several pieces of evidence point to the light weight amines as the principal offenders. In particular, trimethylamine has an odor threshold below 1 ppb and can be detected in feedlot air at concentrations above this. Other amines, ammonia, and perhaps other compounds may also contribute to the odor. Of the several analytical methods tested gas chromatography and paper chromatography showed the most promise. Neither was developed into routine use. (Bundy-Iowa State)
W72-00983

CHEMICAL COMPOSITION OF POULTRY MANURE.

Poultry Digest, p 439-441, September 1971. 4 tab.

Descriptors: *Chemical waste, *Crop response, Essential nutrients, Chemical analysis, Poultry, Organic acids, Rates of application, Nutrients.
Identifiers: *Broiler houses, *Micronutrients, *Laying house, Wasted feed.

The value of poultry manure as a crop fertilizer has been measured primarily in terms of nitrogen, phosphorus, and potassium. Very little consideration has been given to the micronutrients content. There are substantial amounts of calcium, magnesium, and sulfur. The micronutrients includes manganese, iron, boron, copper, zinc, and molybdenum. The mean calcium and magnesium contents of broiler manure were 1.97 and 0.37%, respectively, which were less than for hen manure with calcium content of 3.42% and magnesium of 0.52%. With present knowledge of the requirements of most crop plants for micronutrients indicates that, except in cases of extreme deficiency, application of three to five tons per acre of broiler or hen manure annually would maintain and adequate supply of these elements. (Bundy-Iowa State)
W72-00984

EXTRACTION OF BILE ACIDS FROM RAT FECES CONTAINING CHOLESTYRAMINE,
Mead Johnson Research Center, Evansville, Ind. Dept. of Nutritional Research.
J. D. Manes, and D. L. Schneider.
Journal of Lipid Research, Vol 12, No 3, p 376-377, 1971.

Descriptors: *Gas chromatography, *Rodents, Chemical analysis, Laboratory animals, Laboratory tests, Methodology, Test procedures, Analytic techniques.
Identifiers: *Bile acids, Gas-liquid chromatography, OV-21.

The fecal extraction procedure described by Evrard and Janssen was inadequate for the complete extraction of conjugated bile acids from feces containing the bile acid sequestrant, cholestyramine. As judged by gas-liquid chromatographic analysis, substitution of 0.5 n HCl in absolute ethanol for glacial acetic acid allowed for complete recovery (98-104%) of three different conjugated bile salts in the presence of the resin. (Parker-Iowa State)
W72-00986

METHODS OF SAMPLE PREPARATION FOR CHEMICAL DETERMINATION OF CHROMIC OXIDE IN BOVINE FECES,
Kentucky Univ., Lexington. Dept. of Animal Science.
P. R. Utley, N. W. Bradley, and J. A. Boling.
Journal of Dairy Science, Vol 54, No 7, p 1091-1093, July 1971. 1 tab, 11 ref.

Descriptors: *Animal waste, *Chromium, *Nutrient, Chemical analysis, Laboratory, Indicators, Diurnal, Digestion, Statistical method, Time series analysis, Diet.
Identifiers: *Corn-urea diet, Blender, Chromium oxide, Feces, Fecal recovery, Ground corn.

Fecal samples were prepared by four different methods to observe the variation and per cent recovery of added chromic oxide with each method. Variation was greatest in the samples dried and ground with a Wiley mill and those homogenized and analyzed wet. The standard errors of the samples dried and ground with a hand grinder and those homogenized and analyzed dry were lower than those of the other two groups of samples. The average per cent recovery ranged from a low of 98.8% (homogenized, analyzed wet) to a high of 100.2% (homogenized, analyzed dry). The variation in chromic oxide concentration tended to be greater in samples containing the highest per cent moisture at time of analysis. (Bundy-Iowa State)
W72-00994

LASER INDUCED FLUORESCENCE IN RHODAMINE B AND ALGAE,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 05C.
W72-01095

CIRCULATION PATTERNS AND A PREDICTIVE MODEL FOR POLLUTANT DISTRIBUTION IN LAKE ERIE,
New York State Univ., Buffalo.
For primary bibliographic entry see Field 05C.
W72-01102

5B. Sources of Pollution

RECOGNITION OF CRUDE OILS BY CAPILLARY GAS CHROMATOGRAPHY,
Esso Research Centre, Abingdon (England).
For primary bibliographic entry see Field 05A.
W72-00573

ASSESSMENT OF SURFACE WATER QUALITY BY A SINGLE INDEX OF POLLUTION,
Ferrara Univ. (Italy). Istituto di Igiene.
For primary bibliographic entry see Field 05A.
W72-00577

TURBULENCE IN LAKE HURON,
Sydney Univ. (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02H.
W72-00578

WATER-SOLUBLE N03-NITROGEN, P04--PHOSPHORUS, AND TOTAL SALT BALANCES ON A LARGE IRRIGATION TRACT,
Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center.
D. L. Carter, J. A. Bondurant, and C. W. Robbins.
Soil Science Society of America Proceedings, Vol 35, No 2, p 331-335, March-April 1971. 5 p, 1 fig, 4 tab, 25 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Return flow, *Phosphates, *Nitrates, Salinity, Nutrients, Idaho, Leaching, Irrigation water, Path of pollutants.
Identifiers: *Snake River (Idaho).

Return flow from a 82,030-ha tract of calcareous silt loam soils irrigated with water diverted from the Snake River in southern Idaho increased the downstream total soluble salt and No 3 loads, but decreased the downstream P04 load. Under the existing water management practice, 50% of the total input water returned to the Snake River as subsurface drainage. Net total soluble salt output was 2.4 metric tons/ha and, on the average, was considerably greater than necessary to maintain a salt balance. Net N03 output was 33 kg/ha. Only about 30% as much P04 left the tract via drainage water as entered the tract in irrigation water. As water passed through the soil, P04 was removed by chemical reactions in the soil, thus decreasing the concentration in the subsurface drainage water and decreasing the downstream P04 load. Applied P fertilizer was not leached into the drainage water. (Knapp-USGS)
W72-00597

USE OF THE METHOD OF DIRECT BACTERIAL COUNT IN THE STUDY OF THE SELF-PURIFICATION OF UNDERGROUND WATERS, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
A. G. Kokina.
Gidrobiol Zh. 6 (1): 104-108. Illus. 1970.
Identifiers: Ammonia, Bacterial, Biochemical, Combine, Contaminants, Count, Ground, Index, Meat, Method, Minsk, Organic, Oxygen, Purification, River, Self, Svisloch, Under, USSR.

The contamination of underground waters at various distances from the Minsk Meat Combine was determined bya direct count of bacteria and also by determining chemical indices of contamination. There was a general correlation between bacterial count and the content of ammonia N in the water,

but the degrees of correlation varied with the distance from the source of contamination and the season. Determination of relations between bacterial count and the biochemical consumption of O2 used as an index of organic contamination in a study of the self-purification of water from the Svisloch River indicated tht in winter, the count was lower than the biochemical index. Conditions similar to those observed for water from an open body such as the Svisloch River (in winter) were found for the interrelationship between the bacterial count and the chemical index in underground water. The bacterial count lag indicated delayed purification in both cases.--Copyright 1971, Biological Abstracts, Inc.
W72-00654

WATER STATUS OF SOD-PODZOLIC SANDY SOILS ON DEEP SANDS IN POLESIE (IN UKRAINIAN),
For primary bibliographic entry see Field 02G.
W72-00670

HYDROLOGY OF THE YTHAN ESTUARY WITH REFERENCE TO DISTRIBUTION OF MAJOR NUTRIENTS AND DETRITUS,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
For primary bibliographic entry see Field 02L.
W72-00711

POLLUTION OF THE LOWER MEURTHE (RIVER). INFLUENCES ON THE DEVELOPMENT OF ALGAL POPULATIONS (FRANCE) (IN FRENCH),
Jean-Francois Pierre.
Bull Acad Soc Lorraines Sci. 8 (4): 255-269. 1969. English summary.
Identifiers: Algal, Aut, Development, Ecology, Flora, France, Meurthe, Pollution, Populations, River.

The physical and chemical characteristics of the water were studied in the Basse-Meurthe to determine the level of pollution. Many algae live in this biotope, the evolution of the algal flora, and the autoecology of some species, were studied. The Basse-Meurthe and the rivers Moselle, Seille, Meuse and Fecht are compared. In spite of the heavy mineral and organic pollution, a diversified algal flora is present in the Meurthe.--Copyright 1971, Biological Abstracts, Inc.
W72-00722

CHLORINATED HYDROCARBON INSECTICIDE RESIDUES IN WINTER FLOUNDER, PSEUDOPLEURONECTES AMERICANUS, FROM THE WEWEANTIC RIVER ESTUARY, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Forest and Wild Life Management.
Roderick M. Smith, and Charles F. Cole.
J Fish Res Bd Can. 27 (12): 2374-2380. 1970.
Identifiers: Accumulation, Carbon, Chlorinated, DDT, Estuary, Flounder, Heptachlor, Hydro, Insecticide, Massachusetts, Pseudopleuronectes-Americanus, Residues, River, Seasonal, USA, Weweantic, Winter.

Residues of DDT, heptachlor, and dieldrin were found in tissues of P. americanus (Walbaum), from the Wewantic River estuary, Massachusetts during 1966-67. In non-migratory juveniles, seasonal accumulation patterns were demonstrated for DDT, heptachlor, and 2 related breakdown products, DDE and heptachlor epoxide. Peak concentrations of the parent compounds were more closely associated with high runoff conditions than any specific application in the estuarine drainage. Dieldrin was present uniformly throughout the year. Migratory adult flounder, present only between Oct. and May, contained heptachlor and heptachlor epoxide levels similar to juveniles, but significantly less DDE. Adult female flounder sequentially concentrated DDT, DDE, and heptachlor epoxide in their ripening ovaries as the spawning season approached.--Copyright 1971, Biological Abstracts, Inc.
W72-00737

VARIATION OF URBAN RUNOFF WITH DURATION AND INTENSITY OF STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 04C.
W72-00816

THE DISPOSAL OF AGRICULTURAL WASTE,
Douglas Gowan.
Effluent and Water Treatment Journal, p 303-308, June 1971. 2 tab, 10 ref.

Descriptors: *Waste disposal, *Farm wastes, Water pollution, Fertilizers, Farm management, Livestock, Economics, Copper, Arsenic compounds, Odor, Sewers, Biochemical oxygen demand, Slurries, Chlorides, Ammonia, Nitrogen, Dairy industry.
Identifiers: United Kingdom, Farm income.

The present United Kingdom laws make it unlawful to discharge farm drainage into a stream without consent of river authorities; river authorities also have power to control pollution of underground water. Over 131,000 farm discharges to watercourses in the United Kingdom are known, the combined effect posing serious consequences. The basic need is cheaper methods of dealing with manure and other wastes from large animal concentrations. Cattle wastes have quite different characteristics from domestic wastes and chemical residues from feed additives can give rise to serious difficulties in the effects on biological treatment processes. To control odor of animal excreta, ammonium persulphate has proven effective. Farm wastes disposal onto land and into public sewers are discussed and population equivalents are considered. Every farm is different and must be treated individually for assessing charges for reception and treatment in the public sewer. Discharges from dairy farms and from mixed farms are tabulated. Today local authorities have the means of obtaining relatively accurate information for design of treatment plants as well as for the assessment of charges. (Jones-Wisconsin)
W72-00843

THE FATE OF THE DEAD LEAVES THAT FALL INTO STREAMS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-00848

A WATER QUALITY PREDICTION MODEL AND A WATER QUALITY SIMULATION PROGRAM FOR THE WABASH RIVER,
Purdue Univ., Lafayette, Ind.
D. W. Weeter.
Ph D Thesis, Purdue University, January 1971. 271 p, 23 fig, 40 tab, 155 ref, 7 append. OWRR A-013-IND (2).

Descriptors: *Mathematical models, *Simulation analysis, *Probability, *Dissolved oxygen, *Biochemical oxygen demand, *Water quality control, Input-output analysis, Waste water treatment, Statistical methods.
Identifiers: *Wabash River.

An analysis was conducted of available water quality data for the Wabash River from Huntington to Covington. For prediction of observed field data, a diurnal photosynthetic effect mathematical DO (dissolved oxygen) prediction model was employed. The mathematical model for the prediction of dissolved oxygen deficit was expressed. The range of the correlation coefficients between the dissolved oxygen profiles calculated by the model and the observed field data profiles was given. The variable photosynthetic model predicted the minimum and maximum observed DO values. The Log-log relationships of time of travel and the reaeration coefficient as a function of flow were developed. From the available water data, the values for oxygen demand of benthal sludge deposits, oxygen demand of incremental land runoff and the nitrification coefficient were not quantifiable. DOSAG, a FORTRAN IV computer program, was developed to simulate the proposed model The program permitted calculation of DO and biochemical oxygen demand at selected mile stations for a slug of water flowing through the stream, and included analysis of the water quality control alternatives of either flow augmentation or waste reduction. Sensitivity studies indicated that an increase in the flow regime did not improve the dissolved oxygen concentration in the Wabash River. (Markell-Cornell)
W72-00860

ENVIRONMENTAL MONITORING ASSOCIATED WITH DISCHARGES OF RADIOACTIVE WASTE DURING 1969 FROM UKAEA ESTABLISHMENTS,
United Kingdom Atomic Energy Authority, Herwell (England). Authority Health and Safety Branch.
E. T. Wray.
Available from the National Technical Information Service as AHSB (RP)R-105. Price - $3.00, Microfiche $0.95. Atomic Health and Safety Branch report no. AHSB (RP)R-105.

Descriptors: *Monitoring, *Discharge measurement, *Effluents, *Radioisotopes, *Waste disposal, *Waste storage, *Water pollution, Water pollution sources, Water pollution control, Radioactive waste, Water Quality Act, Path of pollutant, Food chains, Sampling, Surveys, Marine algae, Aquatic life, Milk, Atlantic Ocean, Landfills, Disposal, Regulation, Water policy, Governments, Gases, Nuclear wastes.
Identifiers: Concentration, Environmental monitoring.

This report summarises the results of the monitoring programs carried out in connection with radioactive waste discharges from the principal establishments of the UKAEA in 1969. The information given includes the essential freatures of the authorizations for discharges which were made the results of environmental monitoring. Derived working limits are quoted to provide a basis for comparison of the environmental monitoring results. Most establishments carried out sampling and analysis additional to the minimum required by statute, and some reference to this has been made in the report. One of the principal methods of estimating the effect of gaseous discharges to the environment is by the sampling and analysis of milk. The activity found in the vicinity of Authority establishments is almost always due to fallout and not to contamination of the environment by the establishment itself. Methods of treatment of radioactive waste in the UKAEA have been under investigation with the object of improving the system of handling and discharge of the waste. The appendix to the report contains a summary of the general principles governing the nature of the possible hazards which might arise as a consequence of these discharges. (Houser-NSIC)
W72-00941

STUDY AND DEMARCATION OF POLLUTION IN NON-SATURATED SOILS, (ETUDE ET DELIMITATION DEL'EVOLUTION DE LA POLLUTION DANS LES SOLS NON SATURES),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
D. Rancon.
Available from UNIPUB, Inc., P. O. Box 433, New York, N.Y. 10016. Nuclear Techniques in Environmental Pollution. Vienna; International Atomic Energy Agency (1971). (STI/PUB-268; CONF-701023) p 551-63, 8 fig, 5 ref.

Descriptors: *Water pollution control, *Nuclear wastes, *Monitoring, On-site inveatigations, Food chains, Ion exchange, Absorption, Soil contamination, Drainage effects, Soil chemical properties, Permeability, Soil moisture, Soil moisture meters, Soil water movement, Reservoir operation, Water quality control, Reservoir storage, Nuclear meters, Radioactivity techniques, Nuclear moisture meters.
Identifiers: Soil, Radionuclide movement through, Monitoring system, Radiation, Neutron moisture gage.

To monitor aquifers, a method was developed to evaluate soil pollution. Warning of pollutants associated with water movement is given by a neutron moisture gage introduced into borehole tubes, and a radioactivity probe is introduced for radioactive pollutants. Tests were made with Sr-85 to represent elements retained by minerals and with I-131 for those which are not. (Future work is planned in which the specific activity is regulated by inclusion of a stable carrier.) The behavior of already polluted soil was also studied, when it was traversed by seepage waters discharged at the surface. (Bopp-NSIC)
W72-00942

TRACER METHODS FOR PREDICTING THE PROPAGATION OF POLLUTANTS IN HYDRAULIC SYSTEMS AND LOCATING AN UNKNOWN RELEASE POINT, (IN FRENCH),
Commisariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
J. Guizerix, Y. Emsellem, and P. Corompt.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016. Nuclear Techniques in Environmental Pollution (STI/PUB-268; CONF-701023). Vienna; International Atomic Energy Agency (1971). p 583-602.

Descriptors: *Path of pollutants, *Tracers, *Water pollution sources, Canals, Water pollution control, Regulation, On-site investigations, Monitoring, Administrative agencies, Foreign research, Fourier analysis, Mathematical models, Fluorescence, Flow.

The case of instantaneous injection of a tracer which is continued at a constant rate was compared with other source functions simulating the draining, washing, and pumping out of tanks. Downstream response functions were determined in a canal, 1 m wide by 0.8 m deep, for which the flow rate was 1.2 cu m/sec. Responses for the different source functions deviated markedly as the distance increased beyond about 5400 m. (Bopp-NSIC)
W72-00943

I-131 DISCHARGES FROM AN OPERATING BOILING WATER REACTOR NUCLEAR POWER STATION,
Environmental Health Service, Rockville, Md.
G. E. Stigall, T. W. Fowler, and H. L. Krieger.
Health Physics Journal, Vol 20, No 6, p 593-599, June 1971.

Descriptors: *Nuclear powerplants, *Water pollution effects, *Discharge measurement, *Iodine, *Electric powerplants, *Environmental effects, Water pollution source, Food chains, Surveys, Sampling effluents, Evaluation, Radioisotopes, Nuclear reactors.
Identifiers: Dresden, Concentration, Reconcentration, Surveillance program.

This paper presents an analysis of the relationships between the I-131 concentrations measured at different points and delineates the implications of these relationships. The data presented are from samples collected over a relatively short period of time, 20-22 August 1968, thus enabling such relationships to be determined. The observed I-131 concentrations may have differed if data taken during another phase of the power run had been analyzed; however, the data obtained during 20-22 August 1968 should allow representative relationships to be determined. The I-131 concentrations may vary, but the relationships between the concentrations are expected to remain approximately the same. The objective in deriving such relationships is to characterize BWR nuclear power plants as a source of environmental I-131. Because of the reconcentration of I-131, considerable effort has been made in surveillance programs around BWR nuclear power plants to measure I-131 levels in milk. However, milk samples collected and analyzed in such surveillance programs do not generally have detectable levels of I-131 unless the area is experiencing fresh fission product fallout from weapons testing. Such negative results tend to raise more questions than answers which indicates a need for an analysis of I-131 in-plant and effluent concentration data. Such data were derived from the Dresden study and this paper is a followup evaluation of the public health significance of I-131 discharges from BWR nuclear power plants. (Houser-NSIC)
W72-00951

THE BIOLOGICAL COST OF DISCHARGING HEAT TO RIVERS,
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).
R. F. Foster, R. T. Jaske, and W. L. Templeton.
Availability: Unipub, Inc, P. O. Box 433, New York, N.Y. 10016. 1971 Geneva Conference Paper, Nuclear USA, Vol 2, A/CONF-49/P-086, p 3.3-19-28, Sept 6-16, 1971.

Descriptors: *Nuclear powerplant, *Steam, *Electric power, *Thermal powerplants, *Discharge (Water), *Waste water (Pollution), Water pollution sources, Steam turbines, Thermal pollution, Effluents, Environmental effects, Water pollution effects, Ecosystems, Biological communities, Food chains, Aquatic life, Rivers, Pollution abatement, Electric power production, Columbia River, Ohio River, Tennessee River.

Studies made on rivers which have been receiving the cooling water from large nuclear or fossile fueled plants provide a valuable insight into the kinds and magnitudes of environmental effects that can be expected at future large thermal stations. Because of foresight and prudence, several studies were initiated in rivers of the United States years in advance of the current public awakening and concern about thermal loading of streams. The ones described embrace a wide range of climatic, hydraulic, and biological conditions. The fishery resources of three major rivers of the U.S. that receive cooling water from large fossil fuel or nuclear plants have not been discernably affected by heat from the existing plants. Adverse effects on zooplankton, bottom organisms and the condition of resident fish have been observed in discharge canals and in mixing zones when temperatures approximated 35 degrees F. However, the zones of effect are very small in relation to the size of the productive areas of the Columbia, Tennessee, and Connecticut Rivers as a whole. No block to the migration of either adults or young fish has been detected. Continued observations on rivers with thermal plants will be necessary to demonstrate whether or not small upward shifts in historic temperatures result in any biological cost of significance as a result of long term subtile effects. (Houser-NSIC)
W72-00953

NUCLEAR USA - PEACEFUL USES OF ATOMIC ENERGY, VOL 1 AND 2, GENEVA, SWITZERLAND, SEPTEMBER 6-16, 1971.
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).
For primary bibliographic entry see Field 03A.
W72-00954

RADIOACTIVE FOODCHAINS IN THE SUB-ARCTIC ENVIRONMENT. TECHNICAL PROGRESS REPORT, AUGUST 15, 1970-AUGUST 14, 1971,
Helsinki Univ. (Finland).
Jorma K. Miettinen.
Available from National Technical Information Service as NYO-3446-15, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report NYO-3446-15, May 1971. 120 p, 18 fig, 24 tab, 157 ref. AEC Contract AT (30-1)-3446.

Descriptors: *Radioecology, *Food chains, *Radioactivity effects, Water pollution effects, Lead radioisotopes, Radium radioisotopes, Livestock, Deer, Invertebrates, Aquatic life, Ecosystems, Sea water, Fresh water, Plankton, Diets, Radium radioisotopes, Sediments, Benthic fauna, Sodium, Potassium, Absorption, Fallout, Fish.
Identifiers: Polonium radioisotopes, Iron radioisotopes, Cesium radioisotopes, Radionuclide uptake.

One of 10 papers and preprints appended to this program report is Pb-210 and Po-210 in Some Aqueous Ecosystems and Food Chains, by Pentti Kauranen and J.K. Miettinen; topics of the other reports include Cs-137 body burdens of reindeer-herding Lapps, Fe-55 in Lapps and reindeer, diet of Lapps (as affected by a new road and snowmobiles), and Pb-210 and Po-210 in large terrestrial animals. Pb-210 in lake water (0.11 pCi/1) and in Gulf-of-Finland water (0.02 pCi/1) exceeded Po-210, but enrichment in plankton and bottom invertebrates was greater for Po-210 (2.7 pCi/g dry weight in plankton and 3-24 pCi/g dry weight in invertebrates) than for Pb-210 (about 1 pCi/g in plankton and less in invertebrates). The average daily intake by the Finnish population of Po-210 from fish is estimated to be 1 pCi/day. (Bopp-NSIC)
W72-00957

TRITIUM INCORPORATION IN ALGAE AND TRANSFER IN SIMPLE AQUATIC FOOD CHAINS,
Chicago Univ., Ill. Dept. of Biology; and Argonne National Lab., Ill.
G. M. Rosenthal, Jr., and M. L. Stewart.
Available from National Technical Information Service as CONF-710501-24, $3.00 in paper copy, $0.95 in microfiche. AEC Report CONF-710501-24, May 1971. 16 p, 3 tab, 9 ref.

Descriptors: *Tritium, *Food chains, *Nuclear wastes, Absorption, Aquaria, Chlorophyta, Waterfleas, Shrimp, Snails, Aquatic animals, Water pollution effects, Bound water, Cytological studies, Water balance, Tracers, Radioisotopes, Radioactivity effects.
Identifiers: Radionuclide uptake.

Uptake of tritium from tritiated water by a unicellular green alga (Chlamydomonas reinhardti) was studied. There was a 25-30% discrimination against uptake of tritium into the organic molecules of algal cell fluid during growth in tritiated water. The organically bound tritium in animals (water fleas, fairy shrimp, snails, and tree-frog tadpoles) feeding on the tritiated alga was of the same magnitude as in the alga, but there was a 3-10-fold discrimination against uptake from tritiated water. It was concluded that the high turnover rate of hydrogen and the absence of a biological sink minimize incorporation of bound tritium. (Bopp-NSIC)
W72-00958

FALLOUT RADIOCESIUM IN SEDGES AND TROUT OF A CASCADE-MOUNTAIN BOG,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
W. H. Rickard, and L. L. Eberhardt.
Available from National Technical Information Service as BNWL-SA-3878, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report BNWL-SA-3878 (CONF-710501-12), 1971. 3 fig, 3 tab, 8 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Fallout, *Cutthroat trout, *Aquatic plants, Absorption, Radioactivity effects, Path of pollutants, Bogs, Deficient elements, Nutrient requirements, Cycling nutrients, Mountain forests, Food webs.

Identifiers: Cesium radioisotopes, Radionuclide uptake, Cascade Mountains.

There is more radiocesium in the coniferous forest floor of the western slope of the Cascade Mountains than of the drier eastern slope. Bog plants (sedges) assimilate radiocesium from the surrounding forest; and fish, through the aquatic food web. Radiocesium in sedges was 5-30 pCi/g; and in cutthroat trout, 1-5 pCi/g. Generally, more was present in larger than in smaller fish. More was present in sedges in spring than in autumn. Radiocesium uptake by bog biota is enhanced by deficiency in mineral nutrients and high rainfall, environmental conditions characteristics of the bog. (Bopp-NSIC)
W72-00961

FISSION PRODUCT METABOLISM AND ... RADIOACTIVE CONTAMINATION OF THE FOOD CHAIN, PROGRESS REPORT JAN. 1, 1968 TO JUNE 30, 1969,
New York State Veterinary Coll., Ithaca.
For primary bibliographic entry see Field 05C.
W72-00962

FALLOUT STUDIES AND THEIR RELATIONSHIP TO THE GENERAL PROBLEM OF ENVIRONMENTAL RADIOCONTAMINATION,
New York State Veterinary Coll., Ithaca. Dept. of Physical Biology.
J. C. Thompson, Jr.
Available from the National Technical Information Service as NYO-4039-1, $3.00 in paper copy, $0.95 in microfiche. Report NYO-4039-1, p 84-98. 2 fig, 6 tab, 11 ref. AEC Contracts AT (30-1)-2147 and AT (30-1)-4039.

Descriptors: *Nuclear wastes, *Fallout, *Aquatic life, Lake fisheries, Ecotypes, Food chains, Strontium radioisotopes, Nuclear powerplants, Sites, Water pollution effects, Radioactivity effects, Control, Bottom sediments, Lake soils, Tritium, Potassium radioisotopes, Radioecology.
Identifiers: Cesium radioisotopes.

Fallout data for Cayuga lake and similar ecosystems was compared to predict effects from a proposed nuclear powerplant. Higher radiocesium was found in bottom sediments (2400 picoCuries/kilogram) than in shallow regions where the concentration was similar to that of terrestrial soil (700-900 pCi/kg). Radiostrontium in fish flesh was 2-60 pCi/kg; radiocesium, 13-260 pCi/kg. The ratio of radiostrontium to calcium did not differ much between fish flesh and bone. A higher proportion of muscle caused a higher radiocesium content in large fish (140-170 pCi/kg) than in small fish (20-70 pCi/kg). The K-40 content was 10,000 pCi/kg in sediment and soil, 3000-4500 pCi/kg in fish, 1700-5400 pCi/kg in vegetation, and 1000 pCi/liter in water. Concentration factors of fish were 2800-4100 for K-40, 700-3300 for Cs-137, 2-40 for Sr-90 in flesh, and 190-340 for Sr-90 in bone. Tritium concentration of the water was 1000 pCi/liter; Co-60 was not detectable. (Bopp-NSIC)
W72-00963

INVESTIGATION ON PB-210 CONCENTRATIONS IN VARIOUS REGIONS OF INDIA,
Atomic Research Centre, Trombay (India).
L. U. Joshi, C. Rangarajan, and S. S. Gopalakrishnan.
Health Physics Journal, Vol 20, No 6, p 665-668, June 1971.

Descriptors: Measurement, *Lead radioisotopes, *Uranium, *Radium, *Soil contamination, *Air pollution, Precipitation (Atmospheric), Radiation, Radium radioisotopes, Rainfall, Seasonal, Winter, Hydrologic cycle, Radioisotopes, Wet seasons.

Seasonal measurements of Pb-210 were carried out to explore the possibility of increased Pb-210 levels resulting from high uranium of Ra-224 activity of the soil. Seasonal variations of Pb-210 were measured at Srinagar, Delhi, and at Nainital where results did not show a pronounced variation. The radon daughter activity was compared with that of Pb-210 at Bombay and the latitudinal variation of Pb-210 was plotted in surface air and rainfall. At Gangtok the results were higher than a factor of 2, than those of the other stations, the increase occuring mainly in the winter months, and not apparently due to a significant increase in Ra-226 in the soil. (UK) Meteorological data showed that the most likely reason for the seasonal variation of radon is the greater prevalence of inversion conditions in winter although a secondary cause could be the change of surface winds from the continental North-East monsoon to the South-West monsoon in summer. Studies on the latitudinal variations of specific activity showed that air concentrations at the stations previously measured were not significantly different. A more significant variation of the specific activity of rainfall was however noted with a sharp increase towards higher latitudes. (Houser-NSIC)
W72-00964

SEMIANNUAL REPORT OF ENVIRONMENTAL LEVELS OF RADIOACTIVITY IN THE VICINITY OF THE LAWRENCE LIVERMORE LABORATORY, JAN.--JUNE 1971,
California Univ., Livermore. Lawrence Radiation Lab.
P. H. Gudiksen.
Available from the National Technical Information Service, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report UCRL-51093, July 12, 1971. 24 p.

Descriptors: *Environment, Surveys, *Measurements, *Sites, *Radioisotopes, *Sampling, *Air, Soil contamination, Water pollution, Sewage effluents, Fallout, Gamma rays, Uranium, Plutonium, Tritium, Strontium, Regulation, Air pollution.
Identifiers: Surveillance program, Gross Beta, Gross Alpha.

An environmental surveillance program was conducted within the Livermore Valley and Site 300 areas to determine the effect of the Lawrence Livermore Laboratory operations on the surrounding environment. Analyses for gross radioactivity and for specific radionuclides of interest in a variety of environmental samples were performed. The results of these analyses are provided in the report. Air particulates, soil, water, and sewage samples showed similar gross radioactivities to those measured during the past year. Gamma spectral measurements of on-site airborne particulates revealed detectable activities of the typical gamma emitters observed in global fallout. Isotopic uranium analyses of particulates collected on air filters at Site 300 indicate the uranium in the particulates was depleted in 235U with respect to that for natural uranium. Soil samples subjected to plutonium, strontium and gamma spectral analyses showed no detectable buildup of these activities in the off-site environment. The stack sampling program indicates the escape of a small amount of tritium. An appendix gives the environmental activity guide levels. (Houser-NSIC)
W72-00965

PREDICTIONS OF LONG DISTANCE RADIOACTIVITY AND RADIATION DOSES TO MAN IN 13 HYPOTHETICAL EXCAVATION APPLICATIONS,
California Univ., Livermore. Lawrence Radiation Lab.
T. V. Crawford, K. R. Peterson, and J. B. Knox.
Available from the National Technical Information Service. $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report, UCRL-50936, Rev 2, June 1971. 51 p.

Descriptors: *Nuclear explosions, *Excavation, *Radioactivity, Radioisotopes, *Radioactivity effects, *Path of pollutant, Population, Regulation, Standards, Cesium, Strontium, Fallout, Harbors, Water pollution, Water pollution sources, Food chains, Clouds, Meteorology, Human population, Standards.
Identifiers: Plowshare, Peaceful uses.

Methodology is presented here for calculating the long distance radioactivity and radiation dose to man from nuclear explosives used peacefully in excavation applications. The calculations follow the life history of biologically significant radionuclides: from their production through venting to the atmosphere, their transport and diffusion in the atmosphere, deposition on the ground, and routes through various exposure pathways to man. Calculations are presented for 13 potential applications around the world. The calculations then are compared to three standards: (1) the population dose limits recommended by the International Commission on Radiological Protection (ICRP), (2) the dose from natural background, and (3) the decay of the accumulated amounts of 137Cs and 90Sr that have been deposited from past atmospheric nuclear explosions. Cloud trajectories and various possible plowshare applications are graphically presented for each of 13 geographic locations. (Houser-NSIC)
W72-00975

PRELIMINARY EVALUATION OF HYDROLOGIC FACTORS RELATED TO RADIOACTIVE WASTE STORAGE IN BASALTIC ROCKS AT THE HANFORD RESERVATION, WASHINGTON,
U. S. Geological Survey, Richland, Wash. Water Resources Div.
A. M. La Sala, and G. C. Doty.
Available from the U.S. Department of Interior, Geological Survey, Water Resources Division, Washington, D.C. U.S. Geological Survey Open File Report, and AEC Report TID-25764, 1971. 68 p.

Descriptors: *Hydrologic aspects, *Hydrologic budget, *Hydrologic cycle, *Groundwater, *Rocks, Rock mechanics, Rock properties, Hydraulic machinery, Hydraulic properties, Drill holes, Drilling, Groundwater movement, Groundwater recharge, Water table, Zone of saturation permeability, Geographical regions, Waste disposal, Hydrographs, Flow, Washington.
Identifiers: Core drilling, Waste storage.

Presents a study of the hydrologic factors related to the feasibility of storing high-level radioactive wastes in deeply buried basaltic rocks of the Hanford Reservation begun in 1969 with drilling of a test well ARH-DC-1. The factors of concern include the rate and direction of ground-water movement, the characteristics of ground-water discharge, and the geochemical nature of the waste-rock-water system that might affect the movement of radionuclides. The well was drilled to 5661 feet. Hydraulic testing to determine the water-bearing properties of rocks and to sample ground water was carried out to a depth of 4280 feet. Testing was not completed because the well was lost following repairs to sections of the well that were caving. Hydraulic testing consisted of (1) pumping tests which gave information mainly on the upper 1200 feet of the section and (2) tests of zones, ranging from 80 to 200 feet in thickness, isolated with hydraulically inflatable packers, by injecting water or removing water with a swab. Under the prevailing head relationships and assuming that the observed geohydrologic conditions are widespread, it may be feasible to store radioactive wastes that would decay to low levels in 600 to 1000 years in mined cavities in thick impermeable rock layers below about 1200 feet in depth. (Houser-NSIC)
W72-00976

INDEXED BIBLIOGRAPHY ON EFFECTS OF RADIONUCLIDES AND IONIZING RADIATION ON ECOLOGICAL SYSTEMS,
Oak Ridge National Lab, Tenn. Nuclear Safety Information Center.
For primary bibliographic entry see Field 05C.
W72-00978

FEED ADDITIVE RESIDUES IN POULTRY MANURE,
Agricultural Research Service, Beltsville, Md.
C. C. Calvert.
Poultry Digest, August 1971, p 396-398.

Descriptors: *Poultry, *Feeds, *Additives, Arsenic compounds, Animal diseases, Farm wastes, Antibiotics, Environmental effects.
Identifiers: *Feed additives, Residues, Growth stimulants.

At this stage, very little is known as to the potential hazard to the environment represented by commonly used feed additives. The amount of residues excreted and the composition of that residue of such additives as antibiotics, arsenicals, nitrofurans and others are discussed. Studies are cited giving the present state of knowledge on these residues and their pollutional effects on the environment. (Parker-Iowa State)
W72-00987

PROLONGED SALMONELLA CONTAMINATION OF A RECREATIONAL LAKE BY RUNOFF WATERS,
Wisconsin Univ., Madison; Medical School. Wisconsin State Lab. Hygiene, Madison.
D. G. Claudon, D. I. Thompson, E. H. Christenson, G. W. Lawton, and E. C. Dick.
Applied Microbiology, May 1971, Vol 21, No 5, p 875-877. 2 tab, 11 ref.

Descriptors: *Salmonella, Water pollution sources, *Recreation facilities, Runoff, Lakes, Beaches, Sampling, Bacteria, Tributaries, Streams, Bayou, Sewage, Wisconsin.
Identifiers: *Lake Mendota, Contamination, Washwater, Moore swab, Madison (Wisc).

In the summer and fall of 1968 various Salmonella serotypes were isolated from a portion of Lake Mendota, the major recreational lake for Madison, Wisconsin. The apparent sources of these organisms were a residential storm sewer and a University of Wisconsin Experimental Farms' washwater drain. Salmonellae were isolated with regularity from a swimming beach located approximately 0.5 mile from these sources. (Parker-Iowa State)
W72-00991

INTERNATIONAL LAW AND MARINE POLLUTION: RADIOACTIVE WASTE AND 'OTHER HAZARDOUS SUBSTANCES',
University Coll., London (England).
E. D. Brown.
Natural Resources Journal, Vol. 11, No. 2, p. 221-255, April 1971. 89 ref, 1 append. with 31 ref.

Descriptors: *International law, *International waters, *Water pollution control, *Radioactive waste disposal, Water pollution sources, Sea water, Radioactivity effects, Oil wastes, Sewage, Nuclear explosions, Ships, Treaties, Organizations, Regulation, United Nations, Water quality, Data collection, Data processing, Law of the sea, Waste treatment, Monitoring, Legislation, Exploration, Sites, Oceans, Radioactive wastes.
Identifiers: *Geneva Convention on the High Seas of 1958.

Existing and proposed rules of international law governing marine pollution from radioactive and other hazardous wastes are reviewed in this paper. Examination of the Geneva Convention on the High Seas of 1958 indicates there is no absolute freedom of waste disposal. Nuclear pollution is studied in relation to its sources and proposed control measures. Such pollution results from: (1) the testing and use of nuclear weapons, (2) the use of nuclear devices for peaceful purposes, (3) the transport of radioactive substances, and (4) the disposal of radioactive wastes. The recommendations of the Brynielsson Report, a recognized authoritative guide on the marine disposal of radioactive wastes, are examined. Marine pollution from outer hazardous substances is discussed in terms of present international law and future proposals. Such pollution occurs from several sources: (1) discharge through pipelines, (2) agricultural runoff, (3) deliberate dumping, (4) the exploration and exploitation of ocean beds, and (5) spillage from ships. United Nations' efforts to call a new conventional to control and prevent marine pollution through international treaties, are discussed. Tentative suggestions are made concerning: (1) the scope of a treaty; (2) the division of responsibilities between national, regional, and global institutions; and (3) essential treaty elements. (Rees-Florida)
W72-01019

DISTRIBUTION OF TRACE ELEMENTS AND CHLOROPHYLL-A IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Y. K. Chau, V. K. Chawla, H. F. Nicholson, and R. A. Vollenweider.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 659-672, 1970. 20 fig, 2 tab, 7 ref.

Descriptors: *Trace elements, *Chlorophyll, *Lake Ontario, Chemical properties, Water analysis, Photosynthesis, Spatial distribution, Manganese, Copper, Iron, Cadmium, Chromium, Colbalt, Molybdenum.
Identifiers: Chlorophyll-a, Zinc, Lead, Nickel, Strontium, Vanadium.

Attempts were made to correlate the subsurface content of chlorophyll a with horizontal and vertical distribution of trace elements, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Sr, V, and Zn in Lake Ontario. Sampling at 45 stations was performed during three cruises in May, July and September of 1969. Subsequent analyses yielded some correlations between the concentration of subsurface chlorophyll a and the content of zinc alone and zinc in combination with copper and iron. In general, high values of chlorophyll a coincided with high concentration of trace elements, but no correlations were statistically significant. Bioassays with water from Lake Ontario suggested that an addition of manganese stimulates photosynthesis. (See also W72-01094) (Wilde-Wisconsin)
W72-01107

5C. Effects of Pollution

HYGIENIC ASSESSMENT OF THE TRACE ELEMENTS COMPOSITION OF DRINKING WATER, OBTAINED BY PARTIAL DESALINATION METHODS, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
T. A. Nikolaeva, A. I. Bokina, Y. A. Rakhmanin, V. P. Plugin, and T. S. Khachatryan.
Gig Sanit. 35 (11): 11-14. Illus. 1970. English summary.
Identifiers: Assessment, Boron, Bromine, Composition, Desalination, Dialysate, Drinking, Element, Human, Hygienic, Methods, Organoleptics, Trace, Water.

The paper contains results of studying the effect of B and Br on the organoleptic properties of water and the opinion of seamen on the taste of the dialysate. Acute, subacute and chronic tests carried out over various types of animals and field observations, showed B and Br were present in the dialysate in concentrations that could have an unfavorable effect on man and animals. Technical measures for decreasing the concentration of B and Br in the dialysate are necessary.--Copyright 1971, Biological Abstracts, Inc.
W72-00650

HYGIENIC STANDARDIZATION OF BISMUTH IN WATER BODIES (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Sverdlovsk (USSR).
K. P. Selyankina, V. G. Lenchenko, A. A. Petina, N. N. Petrova, and L. N. El'Nichnykh.
Gig Sanit. 35 (11): 18-20. 1970. English summary.
Identifiers: Bismuth, Bodies, Concentration, Effluent, Hygienic, Industrial, Maximum, Permissible, Standardization.

Bi contents of effluents from the investigated copper electrolyte plants fluctuated from 1.0 to 8.0 mg/l those in the surface waters, from 0.1 to 0.5 mg/l. A chronic sanitary-toxicologic experiment proved that pentavalent Bi compounds were more toxic than trivalent ones. The maximum permissible concentration of the pentavalent Bi should be set at a level of 0.1 mg/l and that of trivalent at 0.5 mg/l.--Copyright 1971, Biological Abstracts, Inc.
W72-00651

EXPERIMENTAL SUBSTANTIATION OF THE PERMISSIBLE CONTENT OF DIANATE AND 2,3,6-TRICHLORBENZOIC ACID IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
D. I. Golovan.
Gig Sanit. 35 (10): 14-17. Illus. 1970. English summary.
Identifiers: Benzoic-Acid, Bodies, Chloro, Dianate, Organoleptics, Permissible, Substantiation, Tri.

The effect of dianate and 2,3,6-trichlorbenzoic acid (2,3,6-TCBA) on organoleptic properties of water, the sanitary regimen of water bodies and toxic properties were studied in a complex of hygienic investigations. The maximum permissible concentration in a water body of 2,3,6-TCBA was set at a level of 1.0 mg/l and that of dianate at 15.0 mg/l.--Copyright 1971, Biological Abstracts, Inc.
W72-00653

POLLUTION OF AQUATIC BIOTOPES. A MICROBIOLOGICAL AND EPIDEMIOLOGICAL EVALUATION,
Aage Jepson.
Nor Vet Tidsskr. 82 (10): 549-555. 1970.
Identifiers: Aquatic, Biotopes, Cattle, Chemical, Epidemiological, Fish, Microbiological, Mollusc, Pollutants, Pollution, Taenia-Saginata, Tuberculosis.

Pollution of aquatic biotopes may be separated in chemical and microbial pollution, but this distinction is impractical, since there is an intimate relationship between the two. Various methods of purifying waste water are discussed: precipitation of suspended particles seems to be the most efficient among currently employed methods. Polluted water may enter the cycle of nutrients at various levels: drinking water for grazing cattle, fish and fish-borne parasites, mollusks. Cattle are quite resistant to water-borne microorganisms, such as bovine tuberculosis and Taenia saginata, although they are sensitive to the same organisms under other circumstances.--Copyright 1971, Biological Abstracts, Ind.
W72-00655

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF TH232 AND OF NATURAL THORIUM IN DRINKING WATER, (IN RUSSIAN),
Institut Gigieny Truda i Professionalynykh Zabolevanii, Moscow.
P. P. Lyarskii, N. A. Pavlovskaya, A. A. Petushkov, M. R. Zel'tser, and A. V. Provotorov.
Gig Sanit. 35 (7): 46-51. 1970. English summary.
Identifiers: Concentration, Drinking, Maximum, Natural, Permissible, Substantiation, Thorium, Thorium-232.

Literature data and experimental observations were used to define the parameters necessary for calculating the maximum permissible concentration (MPC) of Th232 and that of natural Th in drinking water: fb, E..., the constant of half-elimination of Th group isotopes, etc. The recommended MPC of Th232 in drinking water is 1.0 x

10 to the minus eleven power curie/l or 0.1 mg/l; that of natural Th is 0.35 10 to the minus eleven power curie/l or 0.082 mg/l, if the maximum permissible dose (MPD) equals 1 ber/yr. If the MPD amounts to 3 ber/yr, calculation results should be increased 3 times.--Copyright 1971, Biological Abstracts, Inc.
W72-00656

ENDEMIC GOITER IN GREECE: SOME NEW EPIDEMIOLOGIC STUDIES,
Alexandra Hospital, Athens (Greece).
B. Malamos, D. A. Koutras, G. A. Rigopoulos, P. D. Papapetrou, and E. Gougas.
J Clin Endocrinol Metab. 32 (2): 130-139. 1971.
Identifiers: Coliform, Deficiency, Drinking, Endemic, Epidemiologic, Goiter, Greece, Human, Iodine, New, Pollution, Soil.

A study is presented of some environmental factors associated with endemic I deficiency goiter. A preliminary geologic survey showed that villages with endemic goiter were situated on soil from noncalcareous rocks with considerable erosion and that the drinking water came from superficial surces, whereas villages without endemic goiter were mainly on soil from calcareous rocks (limestone) with drinking water coming from deeper layers. Drinking water from calcareous soils contained significantly more I. These general findings were confirmed in a detailed soil survey of 3 villages, a lowland goitrous village, a mountainous goitrous village, and a lowland goiter-free village. A study of the chemical composition of the soil revealed that the soil from villages with endemic goiter contained significantly less calcium carbonate and less exchangeable cations (Ca...., Mg...., K.., Na..). Chemical analysis of the drinking water showed several significant differences. Drinking water from villages with endemic goiter contained significantly less total salts, I, Cl, carbonate, bicarbonate, Na and Zn, and had a lower electrical conductivity and pH. Bacteriologic studies revealed that the drinking water from the goitrous villages was significantly more often polluted with Escherichia coli I and coli-like organisms. Finally, the capacity of the soil to adsorb I was significantly higher in the villages with endemic goiter. I deficiency is not an isolated epidemiologic phenomenon, but it correlates with several geologic characteristics. Whether these contribute directly to the development of endemic goiter or correlate with it simply because they condition I deficiency remains a subject for future research.--Copyright 1971, Biological Abstracts, Inc.
W72-00664

THE EFFECTS OF CLIMATIC AND ENVIRONMENTAL FACTORS ON THE INCIDENCE OF DIARRHOEIC DISORDERS IN BURMA: I. DATA FROM RANGOON DISPENSARIES,
London School of Hygiene and Tropical Medicine (England).
H. A. K. Rowland, and Daw Ohn Kyi.
Union Burma J Life Sci. 2 (1): 67-74. Illus. 1969.
Identifiers: Burma, Climatic, Diarrheic, Disorders, Dispensaries, Dysentery, Environmental, Human, Incidence, Living, Mangoes-D, Rangoon, Space.

The incidence of diarrhea and of dysentery was calculated for the populations attending 25 Rangoon dispensaries for each of the 12 mo. in 1967. The effect of 14 climatic and environmental factors was investigated by means of multiple regression analysis. Climatic factors had no effect, but the prevalence of mangoes was an important cause of variation in diarrhea incidence between months. Water supply had a profound effect on the incidence of both diarrhea and dysentery and population per medical officer and the attendance of patients suffering from non-diarrheic illness greatly influenced the record attendance of those with diarrheic disorders. The floor space per person in their homes was thought to exert its effect through its relationship with some other unidentified factor and was perhaps related to the attending habits of the dispensary populations which were themselves thought to influence the incidence of both diarrhea and dysentery attendances. Other measures of congestion, sewage disposal and income had no effect on the incidence of either diarrhea or dysentery.--Copyright 1971, Biological Abstracts, Inc.
W72-00665

THE EFFECTS OF CLIMATIC AND ENVIRONMENTAL FACTORS ON THE INCIDENCE OF DIARRHOEIC DISORDERS IN BURMA: II. DATA FROM 30 HOSPITALS,
London School of Hygiene and Tropical Medicine (England).
H. A. K. Rowland, and Daw Yin Mya.
Union Burma J Life Sci. 2 (1): 75-80. Illus. 1969.
Identifiers: Amebic, Burma, Climatic, Diarrheic, Disorders, Dysentery, Environmental, Incidence, Hospitals, Mango-D, Prevalence.

The effect of 5 widely varying climatic factors, of altitude, prevalence of mangoes and pressure on beds on the incidence of 4 diarrheic disorders in 30 hospitals in Burma in 12 successive mo. was examined using multiple regression analysis. In general, the incidences of the 4 disorders were not closely correlated, which suggests that they were distinct entities and not affected similarly by certain factors. Temperatures, relative humidity and rainfall, and altitude had no effect and the pressure on beds seemed only to influence the admission rate for amebic dysentery. Mangoes had a profound effect on all disorders with the exception of amebic dysentery, and in general the variation between months was accounted for. After the effect of all other factors had been taken into account there remained a marked difference in the incidence of all 4 disorders between the 30 hospitals and it seems that this is due to a true variation in incidence in the populations drained by these hospitals. The factors responsible for this variation between hospitals have not been identified and the reason for the profound effect of mangoes is speculative only.--Copyright 1971, Biological Abstracts, Inc.
W72-00666

THE EFFECT OF CLIMATIC AND ENVIRONMENTAL FACTORS ON THE INCIDENCE OF DIARRHOEIC DISORDERS IN BURMA: III. DATA FROM RANGOON DISPENSARIES 1964--67,
London School of Hygiene and Tropical Medicine (England).
H. A. K. Rowland, and Daw Ohn Kyi.
Union Burma J Life Sci. 2 (1): 81-84. Illus. 1969.
Identifiers: Burma, Climatic, Diarrheic, Disorders, Dispensaries, Dysentery, Environmental, Incidence, Mango-D, Rangoon.

The attendance rate at Rangoon dispensaries/1000 population in the city, for diarrhea and for dysentery was calculated for each month over the period 1964-67 and the effects of climatic factors, mango supply and total attendance for all illnesses examined. No effect for the 5 climatic factors could be demonstrated nor for the total attendances for all ailments. Mangoes exerted a marked effect on the incidence of diarrhea and a smaller effect on the incidence of dysentery. All variation in the incidence of diarrhea between the 12 mo. of the year was accounted for, but there remained some variation in the incidence of dysentery between the months after the effects of all other factors had been removed. Between the 4 yr of the study there remained variation in the incidence of both disorders due to some factor (s) not considered in this investigation.--Copyright 1971, Biological Abstracts, Inc.
W72-00667

THE EFFECTS OF CLIMATIC AND ENVIRONMENTAL FACTORS ON THE INCIDENCE OF DIARRHOEIC DISORDERS IN BURMA: IV. DATA FROM THE STATE MENTAL HOSPITAL, RANGOON,
London School of Hygiene and Tropical Medicine (England).
H. A. K. Rowland, Ne Win, and Tin Nyunt Pu.
Union Burma J Life Sci. 2 (1): 85-90. Illus. 1969.
Identifiers: Burma, Climatic, Diarrheic, Disorders, Environmental, Hospital, Human, Incidence, Mango-D, Mental, Rainfall, Rangoon.

The incidence of diarrhea among different categories of patients in a mental hospital was examined over a 12 mo. period. Rainfall correlated negatively with incidence and the supply of mangoes related directly to the prevalence of diarrhea. The floor space per patient in the ward area and the ward population were without effect. The number of admissions and transfers to a ward had a profound effect on the incidence of diarrhea and largely accounted for the marked variation observed between the classes of patients--acute, subacute and chronic. The way in which these factors exerted their effect cannot be elucidated from the data. After the effects of all factors are removed, there still remains a highly significant and unexplained variation in the incidence of diarrhea between the different wards of the hospital, and a smaller variation between the months of the year.--Copyright 1971, Biological Abstracts, Inc.
W72-00668

WIDE VARIATIONS OF FLUORIDE SUPPLY TO INFANTS AND THEIR EFFECT,
Karolinska Institutet, Stockholm (Sweden). Dept. of Cariology.
For primary bibliographic entry see Field 05F.
W72-00696

LAKE ERIE: POLLUTION ABATEMENT, THEN WHAT,
Wright State Univ., Dayton, Ohio. Dept. of Biology.
Jerry H. Hubschman.
Science (Washington). 171 (3971): 536-540. Map. 1971.
Identifiers: Abatement, Biota, Canada, Erie, Lake, Pollution.

Pollution factors acting on Lake Erie and their effect on the biota, productivity and the advantageous utilization of long-term eutrophication are discussed.--Copyright 1971, Biological Abstracts, Inc.
W72-00703

POLLUTION OF THE LOWER MEURTHE (RIVER). INFLUENCES ON THE DEVELOPMENT OF ALGAL POPULATIONS (FRANCE) (IN FRENCH),
For primary bibliographic entry see Field 05B.
W72-00722

EFFECT OF POLLUTION ON THE AQUATIC MACROFLORA OF THE VARKAUS AREA, FINNISH LAKE DISTRICT,
Helsinki Univ. (Finland). Dept. of Botany.
Ulla Kurimo.
Ann Bot Fenn. 7 (3): 213-254. Illus. Maps. 1970.
Identifiers: Aquatic, Domestic, Effluents, Finnish, Flora, Hydrophyte, Industrial, Lake, Macro, Pollution, Sensitivity, Varkaus.

The study area comprises the waters lying on the Haukivesi side of the town of Varkaus, which display varying degrees of pollution, with cleaner waters lying above the factories. The pollution of the waters is caused by different factories, and domestic sources. Five main types of waters are distinguished in the study area. On the basis of frequency and abundance, hydrophytes were divided into 3 groups: those which benefit by the wastes in varying degrees, those which suffer from them in varying degrees, and those which are indifferent to pollution.--Copyright 1971, Biological Abstracts, Inc.
W72-00733

PLANKTON ASSOCIATIONS AND RELATED FACTORS IN A HYPEREUTROPHIC LAKE,
Washington Univ., Seattle. Water and Air Resources Div.
Ronald M. Bush, and Eugene B. Welch.
Available from National Technical Information Service as PB-204 230, $3.00 in paper copy, $0.95 in microfiche. Partial Project Completion Report, August 15, 1971. 34 p, 3 fig, 2 tab, 37 ref. OWRR A-034-WASH (1).

Descriptors: Water pollution effects, *Eutrophication, Lakes, *Nutrients, Algal control, *Cyanphyta, *Nuisance algae, Plankton, Washington, Diatoms, Chlorophyta.
Identifiers: Hypereutrophic lakes, *Moses Lake (Wash).

Cluster analysis was used to group samples collected from ten stations in Moses Lake, Washington, according to the similarity of their contained algal species. During the period 1968 to 1970, nine recurring distinct sample groups, or algal populations, were identified. Of the nine, three were most distinct; they consistently recurred at the same stations, and were dominated by diatom, green, and blue-green algae, respectively. Of the six species of blue-greens that characterized that population, the recreationally nuisance forms, Aphanisomenon flos-aquae and Microcystis acruginosa, were dominant. The blue-green population was the most wide-spread in the lake and occurred in waters that were warmest and contained the lowest concentrations of inorganic nutrients: nitrogen, phosphorus, and carbon. Green algae dominated in waters that received treated sewage effluent and contained relatively high concentrations of nutrients. As the nutrient content declined proceeding away from that area, blue-green algae became dominant. Temporal variation in biomass (chlorophyll content) of the blue-green population was inversely related to phosphate content, but not to the other nutrients. These results support the hypothesis that nuisance blue-green algae dominate in shallow eutrophic lakes during warm summer months when ambient nutrient content is low because, under these conditions, they apparently out-compete other forms for nutrients. (See also W72-00799)
W72-00798

DILUTION AS A CONTROL FOR NUISANCE ALGAL BLOOMS,
Washington Univ., Seattle. Water and Air Resources Div.
For primary bibliographic entry see Field 05G.
W72-00799

BIOASSAYS TO DETERMINE ALGAL GROWTH POTENTIAL OF MICRONUTRIENTS,
Washington State Univ., Pullman. Water Research Center.
William H. Funk, Richard J. Condit, and Wayne T. Craney.
Available from National Technical Information Service as PB-204 232, $3.00 in paper copy, $0.95 in microfiche. July 1971. 66 p, 22 fig, 12 tab, 45 ref, 3 append. OWRR A-033-WASH (1).

Descriptors: Water pollution effects, *Microorganisms, Algal control, *Pollutant identification, Analytical techniques, *Algae, *Nutrients, Lakes, Plant growth, *Molybdenum, Bioassay, Neutron activation analysis.
Identifiers: *Micro-nutrients, *Algal growth.

Adapting continuous culture techniques for the measurement of micro-nutrient effects upon algae growth has been shown to be a satisfactory method. Several refinements and modifications of previously utilized equipment for the study of algae macronutrient uptake made it possible to test the effects of molybdenum upon Scenedesmus quadricauda. However, with the progressively reduced substrate levels of molybdenum two problems became increasingly apparent: (1) Molybdenum contamination of the media by magnesium sulfate approached or surpassed the experimental levels in the dilution cultures and prevented the attainment of a molybdenum deficient control; and (2) The extremely low substrate levels of molybdenum could not be detected by the neutron activation analysis due to interference by the high phosphate concentrations in the media. However, the analyses were useful where either the phosphate concentrations were low (lake water and reagent chemicals) or molybdenum concentrations were relatively high (Trial IV substrates). The contamination problem may be resolved through the purification of the reagent chemicals--however, great care must be exercised, since further contamination can result through careless techniques. Improved molybdenum analysis by neutron activation will allow the future use of continuous flow kinetics analysis--a valuable tool in assessing the effects of trace elements in algal growth.
W72-00801

INFLUENCE OF MEDIUM PH AND CARBON DIOXIDE ON ASSIMILATION OF SOME ORGANIC ACIDS BY SCENEDESMUS QUADRICAUDA,
Moscow State Univ. (USSR), Dept. of Microbiology; and Moscow State Univ. (USSR). Dept. of Soil Biology.
N. F. Piskunkova, and M. N. Pimenova.
Mikrobiologia (USSR), Vol 39, No 6, p 854-857, 1970. 2 tab, 18 ref.

Descriptors: *Cyanophyta, *Growth rates, *Organic acids, *Hydrogen ion concentration, Metabolism, Carbon dioxide, Algae, Cultures, Acidity, Organic compounds.
Identifiers: Scenedesmus quadricauda, Acetate, Pyruvate, Lactate.

The nutrient medium for a pure culture of green alga, Scenedesmus quadricauda, was supplemented by acetic, pyruvic and lactic acids, added as sodium salts in concentration of 0.05%. The effect of acids was recorded in terms of dry biomass accretions. In the presence of light all three acids stimulated the algal growth, but their utilization of the acids was influenced by the pH of the medium. In the dark, good growth of Scenedesmus occurred only in the presence of acetate. Passage of air with 5% carbon dioxide stimulated the growth of test plants in acid media (pH 5.0) enriched in acetate and pyruvate, but reduced the consumption of organic acids. The study suggests that algae in acid water basins deficient in carbon dioxide adapt themselves to utilizing organic compounds. (Wilde-Wisconsin)
W72-00838

A PH-CARBON DIOXIDE METHOD FOR MEASURING AQUATIC PRIMARY PRODUCTIVITY,
Georgia Univ., Athens. Inst. of Ecology; and Georgia Univ., Athens. Dept. of Zoology.
Robert J. Beyers.
Bulletin of the Georgia Academy of Science, Vol 28, p 55-68, 1970. 4 fig, 5 tab, 23 ref.

Descriptors: *Primary productivity, *Measurement, *Methodology, Hydrogen ion concentration, Carbon dioxide, Analytical techniques, Diurnal, Metabolism, Computer programs, Volumetric analysis.
Identifiers: Tonometer burette.

A tonometer and procedures for establishing a relationship between carbon dioxide concentration and pH of water are described. The relationship permits, under certain conditions, to obtain a continuous record of metabolism of aquatic organisms or their primary productivity, by determination of mere pH values of water. The pertinent calculations are accomplished with the help of tables and a computer program. Sample calculations and diurnal metabolism of an ecosystem are included. (Wilde-Wisconsin)
W72-00841

ALTERATIONS IN OXYGEN CONSUMPTION BY BLUEGILLS EXPOSED TO SUBLETHAL TREATMENT WITH COPPER,
Antioch Coll. Yellow Springs, Ohio. Dept. of Biology.
James O'Hara.
Water Research, Vol 5, p 321-327, 1971. 2 fig, 3 tab, 11 ref. FWPCA WP-01281-01.

Descriptors: *Fish, *Oxygen, *Respiration, *Copper, Water quality, Water pollution effects, Toxicity, Sunfishes, Copper sulfate, Testing, Metabolism, Laboratory tests.
Identifiers: *Bluegills, Water quality criteria.

A rapid and sensitive test for adverse effects of toxicants is needed in establishing water quality criteria in pollution control. Since growth and reproduction are metabolic processes requiring oxygen utilization, a deviation from a normal growth and reproductive state caused by toxic stress should be reflected in alterations from the base rate of oxygen consumption. This examines the relationship between copper concentrations and rate of oxygen consumption by fish (juvenile bluegills weighing 5-15 grams). A flowing water respirometer was used. Respiratory depression of fish in the different concentrations was averaged over five days and this value used for statistical comparison for the long term study. Each copper solution was tested for effect on oxygen consumption rate of five or more fish. Respiratory response was strongly correlated with copper concentrations up to the 96-hour median tolerance limit of 2.4 mg/l copper. Higher concentrations produced greater responses although results were more erratic. Copper concentration that caused no alteration in oxygen consumption rate was 0.1 mg/l. This measure provides the necessary tool for establishing water quality criteria. (Jones-Wisconsin)
W72-00842

MAINTENANCE OF A FUNCTIONAL ENVIRONMENT IN THE LOWER PORTION OF THE HUDSON RIVER ESTUARY: AN APPRAISAL OF THE ESTUARY,
Boyce Thompson Inst. for Plant Research, Inc., Yonkers, N. Y.
For primary bibliographic entry see Field 02L.
W72-00844

AQUATIC PLANT COMMUNITIES IN LAKE BUTTE DES MORTS: PHASE 2. EFFECTS OF HIGHER AQUATIC PLANTS, MARSH WATER AND MARSH SEDIMENTS ON PHYTOPLANKTON,
Wisconsin State Univ., Oshkosh. Dept. of Biology.
William E. Sloey.
Wisconsin Dept of Natural Resources, Madison, Project Completion Report, Summer 1969. 20 p, 3 fig, 6 tab, 4 ref.

Descriptors: *Aquatic plants, *Inhibitors, *Marshes, *Lakes, *Phytoplankton, Bioassay, Laboratory tests, Productivity, Absorption, Sediments, Organic matter, Algae, Diatoms, Cyanophyta, Chlorophyta, Bulrush, Plant growth substances, Chlorella, Chlamydomonas, Scenedesmus, Wisconsin.
Identifiers: *Scirpus fluviatilis, *Lake Butte des Morts (Wisc), Growth stimulation, Surface litter.

To verify differences between marsh and open lake water in Lake Butte des Morts (Wisconsin) and to determine if some substance or substances are produced in marshes which inhibit or limit growth of planktonic algae, the effects of marsh water, bottom mud, and aquatic plant extracts upon the photosynthetic rate of natural phytoplankton by use of the C-14 primary production technique were studied. Partially decayed litter and surface organic particles inhibited phytoplankton C-14 productivity while sub-surface litter and decayed organic matter stimulated phytoplankton. Millipore filtered marsh water sometimes stimulated and sometimes inhibited C-14 uptake. A few of the 16 native marsh plants tested inhibited C-14 uptake when

macerated extracts of the plants were employed; the most pronounced inhibitor was Scirpus fluviatilis. The present stands of S fluviatilis in Lake Butte des Morts should be protected and encouraged to proliferate. Some other plant extracts greatly stimulated C-14 uptake of phytoplankton, perhaps due to their production of stimulatory substances or to extraction of minerals and/or plant growth substances from the tissues during maceration. (Jones-Wisconsin)
W72-00845

MANAGING OUR ENVIRONMENT.
Agricultural Research Service, Washington, D. C.
For primary bibliographic entry see Field 05G.
W72-00846

BOTTOM DEPOSITS,
G. W. Foess, and T. H. Feng.
Journal Water Pollution Control Federation, Vol 43, No 6, p 1257-1266, 1971. 80 ref.

Descriptors: *Reviews, *Bottom sediments, *Aquatic environment, Surface waters, Nutrients, Algae, Phosphorus, Nitrogen, Eutrophication, Sediment transport, Cycling nutrients, Degradation (Decomposition), Sampling, Benthic fauna, Sedimentation, Sediment distribution, Physicochemical properties, Pesticides, Trophic level, Gases, Muds, Adsorption, Copper, Clays, Humic acids, Salinity, Oxidation-reduction potential, Radioisotopes, Dredging, Estuaries, Biochemical oxygen demand, Dissolved oxygen, Water pollution sources.

Eighty papers on bottom deposits are reviewed. Studies, covering the field extensively are reported from a wide range, including the Great Lakes, Finland, Long Island Sound, Italy, Alaska, Columbia River, Ohio, and Lake Geneva. Bottom deposits are increasingly recognized for their effect on the quality of overlying waters. Different sediment types, probably related to amount of available phosphorus present, vary in their algal support. The sorption of phosphorus by lake muds under aerobic conditions may be used to remove phosphorus from lake water. Sediment sampling equipment should not only provide an undisturbed sample but also permit reliable subsampling of the retrieved material. The movement of sediments has important practical ramifications, and diverse methods for measuring this were developed. The surface chemistry of bottom deposits received attention from several investigators. Intact sediment cores were used to measure epibenthic algal production and benthic community respiration by following changes in DO in the water over the cores. The biological interactions of bottom deposits with pesticides, heavy metals, and other trace constituents is increasingly important. Tubificid population has been used as an indicator of amount of organic pollution. (Jones-Wisconsin)
W72-00847

THE FATE OF THE DEAD LEAVES THAT FALL INTO STREAMS,
Waterloo Univ. (Ontario). Dept. of Biology.
N. K. Kaushik, and H. B. N. Hynes.
Archiv fur Hydrobiologie, Vol 68, No 4, p 465-515, 1971. 14 fig, 17 tab, 99 ref.

Descriptors: *Organic matter, *Leaves, *Decomposing organic matter, Oak trees, Degradation (Decomposition), Temperature, Nitrogen, Phosphorus, Proteins, Adsorption, Fungi, Bacteria.
Identifiers: Elm leaves, Alder leaves, Birch leaves.

The decomposition rate of tree leaves in stream waters depends on temperature, composition of water, and the nature of foliage. Leaves of elm and hard maple decomposed much faster than those of white oak, beech, and tag alder. Fungi, including Alternaria, Candida, Trichoderma, and Cladosporium, appeared to be more effective than bacteria in the breakdown of foliage. Elm leaves, particularly those with bacterial growth, were the most acceptable food for Asellus communis, Hyalella azteca, and Gammarus lacustris. Changes recorded in the laboratory trials also occurred in leaves placed in streams. (Wilde-Wisconsin)
W72-00848

HYDRARCH SUCCESSION AND NET PRIMARY PRODUCTION OF OXBOW LAKES IN CENTRAL ALBERTA,
Alberta Univ. Edmonton. Dept. of Botany.
A. G. van der Valk, and L. C. Bliss.
Canadian Journal of Botany, Vol 49, p 1177-1199, 1971. 3 fig, 5 tab, 94 ref.

Descriptors: *Plant growth, *Aquatic plants, *Primary productivity, Allogenic succession, Chlorophyll, Lakes, Ecotypes, Succession, Varieties, Standing crop, Systematics, Ecological distribution, Annual turnover, Submerged plants, Floating plants.
Identifiers: Oxbow lakes, Central Alberta (Canada), Emergent plants, Meadow communities.

To test Westlake's hypothesis that there is a steady rise in annual plant production during aquatic and semiaquatic stages, up to and including emergent communities (at which point annual production drops significantly), this study followed four main objectives: to establish successional sequence in oxbow lakes; examine some physical and chemical factors controlling plant distribution and succession; estimate annual production of the herbaceous seral communities by standing crop harvest; and examine changes in chlorophyll content and leaf area during succession (parameters apparently playing a prominent role in controlling plant productivity). Water chemistry and water level fluctuations caused by periodic flooding are the major factors controlling plant distribution and succession. The maximum above-ground standing crop of plant communities follows a delinite pattern with succession; from submerged (ca 200 g/sq m), through floating-leaved (ca 210 g/sq m), to the emergent community ca (465 g/sq m), there is a stepwise increase in annual production, which declines in the meadow community (ca 325 g/sq m). Leaf area index does not change with succession. Chlorophyll's pattern in similar to standing crop, except that submerged communities contain more chlorophyll than floating-leaved. (Jones-Wisconsin)
W72-00850

THE EFFECT OF INORGANIC SEDIMENT ON STREAM BIOTA,
DePauw Univ, Greencastle, Inc. Dept. of Zoology.
James R. Gammon.
Copy available from GPO Sup Doc as SN-5501-0074, $1.25; microfiche from the National Technical Information Service as PB-204 236, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series, December 1970. 141 p, 9 fig, 26 tab, 78 ref, append. EPA Program 18050 DWC.

Descriptors: *Water pollution effects, *Inorganic compounds, *Sediments, *Streams, *Biota, Fish, Invertebrates, Quarries, Limestones, Suspended load, Density, Water pollution sources, Aquatic populations, Standing crop, Sedimentation rates, Aquatic insects, Fish behavior, Turbidity, Aquatic drife, Industrial wastes.
Identifiers: Stonedust pollution.

Quantitative effects of stonedust sediment from a crushed limestone quarry on fish and macroinvertebrate populations of an Indiana stream were studied for four years. Light inputs increasing suspended solids loads less than 40 mg/l, resulted in a 25% reduction in macroinvertebrate density. Heavy inputs caused increases of more than 120 mg/l including some deposition of sediment resulted in a 60% reduction in macroinvertebrate population density. Since most taxa responded to the same degree, population diversity indices were unaffected by density changes. Experimental introductions of sediment caused immediate increases in rate of invertebrate drift proportional to the concentration of additional suspended solids. Standing crop of fish decreased drastically when heavy sediment input occurred in the spring but fish remained in pools during the summer when input was heavy and vacated pools only after sediment deposits accumulated. After winter floods removed sediment deposits, fish returned to pools during spring months achieving 50% normal levels by early June. Only spotted bass was resistant to sediment; however, its growth rate was lower below the quarry than above. Most fish were much reduced in standing crop below the quarry. (Jones-Wisconsin)
W72-00851

MASS CULTURING OF ALGAE IN CONTROLLED LIGHT-DARK DETENTION SYSTEMS: I. EFFECTS OF CULTURE DENSITY,
Norwich Univ., Northfield, Vt. Dept. of Civil Engineering.
G. R. Pyper, W. J. Weber, Jr., and J. A. Borchardt.
Proceedings, Industrial Waste Conference, 21st, May 3, 4, and 5, 1966, p 1003-1020, 8 fig, 2 tab, 20 ref. USPRS Res. Grant WP-00155.

Descriptors: *Algae, Nitrogen, Phosphorus, *Eutrophication, Photosynthesis, Lagoons, Laboratory tests, Light intensity, Photoperiodism, Light penetration, Water pollution effects, Water pollution control, *Nutrients.
Identifiers: *Nutrient removal, Continuous flow system.

The pollution-accelerated aging of surface waters has become a matter of concern over the past several years. Continuing increases in the volumes of wastewater indicate that more thorough purification of these discharges may be the only feasible measure for the protection of our natural waters. Aquatic plants can be utilized in lagoons to extract phosphorus and nitrogen from wastewaters prior to discharge to the receiving water. Laboratory studies have been made on the algal growth rates and yields as a function of dark to light ratios and as a function of algal concentration. The general conclusions are: (1) mass cultures of algae can be grown in a continuous system consisting of a dark reservoir from which the culture can be circulated through a light cell; (2) there is a maximum light utilization rate which gives a maximum yield with respect to dark to light detention times; (3) growth rate varies linearly with dark to light ratios over a broad range of values; (4) nutrient removal characteristics are not adversely affected by light and dark culturing systems; (5) nutrient removal appears to be a function of culture density; (6) current work is only a beginning and must be extended; and (7) a major factor to be studied is the effect of flow velocity through the light cell. (Goessling-Texas)
W72-00917

MEASUREMENT OF PESTICIDE TOXICITY BY FISH RESPIRATION RATE,
Warren and Van Praag, Decatur, Ill.
E. L. Lee, and J. C. Buzzell, Jr.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 585-609, 11 fig, 4 tab, 12 ref.

Descriptors: Water pollution effects, *Pesticides, *Respiration, *Toxicity, Effluents, Laboratory tests, Data collection, *Fish, Lethal limit, *Dieldrin.
Identifiers: Long term effects, *Methyl parathion, Gill damage, Blood serum, Median tolerance, TLm limit, Techniques.

Fish have been widely used to test the toxicity of waste components and other pollutants. The acute toxicity procedure introduced in 1945 yields an estimate of the median tolerance limit using death as the indicative parameter. In order to estimate and predict the long-term effects of potentially toxic substances on fish, it has been necessary, for practical purposes to limit the period of testing. Oxygen consumption, or respiration rate, was selected

as a parameter to study changes due to prolonged exposure to toxic pollutants. A respirometer was designed and constructed from acrylic plastic. Six fish were exposed to the test concentrations, one for the respirometer test and the other five were used to obtain data on blood serum composition and gill damage after exposure. Fifteen liter jars were used as aquaria for the five fish. Test solutions contained methyl parathion (0.1 to 3.2 mg/l) and dieldrin (0.001 to 0.06 mg/l). The respiration rate of fish was confirmed as a good indicator for bioassay studied of toxic materials in water. This method permits the use of the same specimen in long term studies. The respiration rate was a more sensitive indicator than either the albumin-globulin ratio or gill damage. The techniques and procedures used are applicable to other fish and other pollutants. The method can be easily altered to fit local needs and receiving water conditions. (Goessling-Texas)
W72-00921

THE EFFECT OF MAJOR INDUSTRIAL SPILLS UPON STREAM ORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. Center for Environmental Studies.
John Cairns, Jr., John S. Crossman, Kenneth L. Dickson, and Edwin E. Herricks.
Preprint, Industrial Waste Conference, 26th, May 4-6, 1971, 24 p, 10 fig, 2 tab, 11 ref.

Descriptors: *Accidents, *Acids, *Chemical wastes, *Toxicity, Bioassay, Fish, Aquatic insects, Analytical techniques, Sampling, Monitoring, Acclimatization, Water quality control, Water pollution effects.
Identifiers: *Biological stress, *Surber square sampling.

Three separate spills were analyzed to determine their effect on the aquatic life present in the area. The first spill was a controlled acid addition to a 100 ft. straight stretch of healthy stream, the second was an accidental acid spill in a previously exposed stream, and the third was an accidental ethyl benzene-creosote spill. In each case, sampling stations were established at several locations both up stream and downstream of the spill area. For both the acid spills, instability of the aquatic community after the pH shock was evidence by wide fluctions in diversity and density. In the second test, a community alteration after the pH shock was noted, and recolonization was a slow procedure aided mostly by downstream drift. The ethyl benzene-creosote spill eliminated all major fish groups except the minnows, as well as mayflies, stoneflies, caddisflies, and mussels. These and other monitoring studies will hopefully provide scientists with the necessary insight into environmental systems to allow some type of alleviatory action to be taken for future spills. (Lowry-Texas)
W72-00934

ECOLOGICAL STUDIES OF THE CONNECTICUT RIVER, VERNON, VERMONT.
Webster-Martin, Inc., South Burlington, Vt.

Available from National Technical Information Service as NP-18953, $3.00 in paper copy, $0.95 in microfiche. AEC Contract report NP-18953, July 1971. 24 p, 17 fig, 2 tab.

*Nuclear wastes, *Radioactivity effects, *Thermal pollution, Connecticut, Rivers, Post-impoundment, Nuclear powerplants, Ecology, Radioecology, Monitoring, Pollution abatement, Environmental effects, Aquatic life, Fish populations, Phytoplankton, Benthic fauna, Periphyton, Aquatic algae, Plants, Environmental engineering, Cooling towers, Vermont.
Identifiers: Connecticut River.

Aspects of Vermont-Yankee (a nuclear powerplant) operation of special concern to the general public are possible effects of waste-heat disposal on the ecosystem of the river, and discharge of radioactive wastes. The Plant design permits operation of the cooling system in an open or a closed-cycle mode or a hybrid of these modes. Allowable increases in the water temperature of the impoundment created by Vernon Dam have been established by the Vermont Water Resources Board. A pre-operational environmental survey included water properties (temperature, pH, dissolved oxygen, and conductivity), fish, phytoplankton, algal periphyton, benthic fauna, and vascular plants. Samples of water, mud, fish and vegetation are collected routinely and analyzed for radioactivity. Fish sampled from both above and below Vernon Dam included 25 species. (Bopp-NSIC)
W72-00939

RADIONUCLIDES AND SELECTED TRACE ELEMENTS IN MARINE PROTEIN CONCENTRATES,
Washington Univ., Seattle, Lab. of Radiation Ecology.
T. M. Beasley, T. A. Jokela, and R. J. Eagle.
Available from National Technical Information Service as RLO-2225-T-14-2, $3.00 in paper copy, $0.95 in microfiche. AEC Contract report RLO-2225-T-14-2, 1970. 15 p, 4 tab, 18 ref.

Descriptors: *Food chains, *Trace elements, *Lead radioisotopes, Heavy metals, Air pollution effects, Surface waters, Path of pollutants, Marine algae, Marine fish, Absorption, Water pollution sources, Radioactivity effects, Radioactivity techniques.

Consumption of 10-30 g/day of concentrates prepared from surface feeding fishes would substantially increase intake of Pb-210; Po-210; and stable Pb, Co, and Ag. The stable Pb is attributed largely to automotive exhaust pollution of surface waters. It is uncertain whether Ag, Co, Cd, and Cu are derived solely from ecological concentration processes since contamination may occur during processing. Sr-90 in the concentrates was less than 0.05 disintegrations per minute per gram of dry weight. (Bopp-NSIC)
W72-00940

EFFECTS OF IONIZING RADIATION AND TEMPERATURE ON THE LARVAE OF THE PACIFIC OYSTER,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Victor A. Nelson.
Available from National Technical Information Service as RLO-2225-T-1-3. $3.00 in paper copy, $0.95 in microfiche. AEC Report RLO-2225-T-1-3 (CONF-710501-10), May 10, 1971. 24 p, 6 fig, 17 ref. AEC Contract AT (45-1)-2225-T1.

Descriptors: *Water pollution effects, *Oysters, *Larvae, *Radioactivity effects, Tritium, Zinc radioisotopes, Irradiation, X-rays, Thermal pollution, Nuclear powerplants, Bays, Mollusks, Condensers, Environmental engineering, Thermal stress.

Effects from nuclear powerplant discharges were assessed by studies in aquaria. Chronic exposure to .001 Ci/liter tritiated water (3 x 10,000 times greater than now found in Wallapa Bay), to .0001 Ci/liter of zinc-65 (10 to the 7th power times greater), or to 10 rads from x-rays was needed to produce a statistically significant increase in abnormal larvae and a ten-fold greater dose had no effect on rate of development or survival. There was no evidence of an effect of temperature on the sensitivity to ionizing radiation, but a small increase in temperature over that of the Bay was beneficial. Effects from the thermal shock of passing through the condensers were determined. Reasons for the high radiation sensitivity of mollusc larvae are discussed and the present study is compared with those by others. (Bopp-NSIC)
W72-00944

ACCUMULATION AND RETENTION OF TRITIUM (TRITIATED WATER) IN EMBRYO AND LARVAL FISH AND THE RADIATION EFFECT,
Battelle Memorial Inst., Richland, Wash. Ecosystems Dept.
J. A. Strand, W. L. Templeton, and E. G. Tangen.
Available from the National Technical Information Service as BNWL-SA-3711, $3.00 in paper copy, $0.95 in microfiche. AEC Report BNWL-SA-3711 (CONF-710501-16), 1971. 20 p, 3 fig, 5 tab, 6 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Water pollution effects, *Tritium, *Rainbow trout, *Embryonic growth stage, Fish eggs, Nuclear wastes, Radioactivity effects, Absorption, Animal physiology, Fish behavior, Aquaria, Laboratory tests, Radiosensitivity, Food chains, Retention.
Identifiers: Radionuclide uptake.

Literature concerning the effect of tritium in nuclear-powerplant effluents on aquatic food chains is reviewed. In the present study artificially spawned rainbow trout eggs were exposed to spring water spiked with 0.01-10 microCi/ml of tritium. Tritium uptake reached equilibrium within 1-2 days. About 2% of the tritium was organically bound in the egg. Elution by free-flowing water could be approximately described by 1-2 and 17 day half-times. With exposure during embryogenesis in water spiked with 1 microCi/ml, the incidence of abnormal larvae and behavioral and physiological tests failed to show a radiation effect. (Bopp-NSIC)
W72-00945

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Northwest Lab. Richland, Wash. Ecosystems Dept.
C. E. Cushing, and D. G. Watson.
Available from the National Technical Information Service as BNWL-SA-3877, $3.00 in paper copy, $0.95 in microfiche. AEC Report BNWL-SA-3877 (CONF-710501-6), 1971. 12 p, 4 fig, 1 tab, 8 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Zinc radioisotopes, *Food webs, *Carp, *Periphyton, Columbia River, Nuclear wastes, Radioactivity effects, *Water pollution effects, On-site investigations, Aquaria, Absorption, Retention, Food chains, Radioecology.
Identifiers: Radionuclide uptake.

Passage of zinc-65 was followed through the periphyton-carp chain in four artificial streams spiked to 1 pCi/ml (two streams) or 10 pCi/ml (two streams). Light and current were uniform and water temperature, followed that of the Columbia River (about 6 to 18C from January to June, the period of the experiments). Fish and periphyton in the river served as controls. Equilibrium uptake of zinc-65 was reached in about 28 days in periphyton (17 and 90 nCi/g), and in 43 days in the fish (0.25 and 1.3 nCi/g), although with the fish the increase in metabolic activity with increasing water temperature was a complicating effect. Data is also given in terms of specific activities (35 and 210 pCi/mg total zinc for periphyton, 3 and 15 pCi/mg total zinc for carp). (Bopp-NSIC)
W72-00946

EFFECTS OF LIMNOLOGICAL FACTORS ON UPTAKE OF CS-137 FALLOUT BY FISH,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
Niles R.Kevern.
Available from National Technical Information Service, as COO-1795-3, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report COO-1795-3, 1971. 6 p. AEC Contract No. AT (11-1)-1795.

Descriptors: *Fallout, *Food chains, *Bass, Absorption, Radioisotopes, Stable isotopes, Potassium, Water analysis, Lakes, Michigan, Path of pollutants, Analytical techniques, Ion exchange, Electrical conductance, Water quality, Epilimnion,

Reviews, Bibliographies, Seasonal, Fish populations, Regression analysis.
Identifiers: Cesium radioisotopes, Cesium.

Multiple regression analysis of data from 6 lakes gives for Cs-137 in 3-yr-old bass, pCi/g wet wt — 1.6 .. 6.8 (pCi/l of Cs-137 in water) - 0.056 (ng/l of stable Cs)- 0.38 (mg/l of K). Improvement would result from study of a larger number of lakes, and by development of a more sensitive analytical method for stable Cs (applicable to the 20-40 ppt range found in freshwater systems). The present paper summarizes some of the findings of COO-1795-1, -2, -6, and -7; and of the conference papers -4 and -5 (where the effects from parameters operating within fish populations are described in greater detail). (Bopp-NSIC)
W72-00947

EFFECTS OF ENVIRONMENTAL STRESS ON THE COMMUNITY STRUCTURE, PRODUCTIVITY, ENERGY FLOW, AND MINERAL CYCLING IN SALT MARSH EPIPHYTIC COMMUNITIES,
City Coll., New York. Dept of Biology.
John J. Lee, John H. Tietjen, and Robert J. Stone.
Available from National Technical Information Service $3.00 in paper copy, $0.95 in microfiche. AEC Report NYO-3995-18 (1970). 31 p, 7 fig, 1 tab, 21 ref. (CONF 710501-9). AEC Contract AT (30-1)-3995.

Descriptors: *Water pollution effects, *Protozoa, *Marine algae, *Salt marshes, New York, Nematodes, Epiphytology, Primary productivity, Physiological ecology, Radioecology, Radioactivity effects, Absorption, Food webs, Strontium radioisotopes, Marine bacteria, Coastal marshes, Microorganisms.

The purpose was to gain insight into changes in productivity and community structure resulting from radionuclide, thermal, organic, pesticide or herbicide pollution. Foraminifera (protozoa) were isolated in culture and their physiological ecology, energy budgets, mineral cycling, and life cycles studied. Enteromorpha (algae) had high productivity (about 10% of its dry weight/hr at the peak primary productivity during the summer). Removal rates of Ca-45 and Sr-89, 90 from coastal marine environments by incorporation in foraminiferan shells were estimated. Radionuclides are excellent tools for measuring competition, feeding, growth, and mineral cycling rates of foraminifera and nematodes. (Bopp-NSIC)
W72-00948

THE RAIN FOREST PROJECT. ANNUAL REPORT, JUNE 1970,
Puerto Rico Nuclear Center, Mayaguez.
Richard G. Clements, George E. Drewry, and Robert J. Lavigne.
Available from National Technical Information Center as PRNC-147, $3.00 in paper copy, $0.95 in microfiche. AEC Report PRNC-147, issued June 1971. 142 p, 21 fig, 30 tab, 98 ref. AEC Contract AT (40-1)-1833.

Descriptors: *Radioactivity effects, *Ecosystems, *Rain forests, Cycling nutrients, Soil-water-plant relationships, Radioisotopes, Absorption, Radioactivity techniques, Tracers, Path of pollutants, On-site investigations, Food webs, Food chains, Frogs, Lichens, Algae, Fungi, Small animals (Mammals), Cytological studies, Soil chemistry, Radiosensitivity, Radioecology, Fallout, Insect, Soil water movement.
Identifiers: Chemistry of the atmosphere.

Current research in the Terrestrial Ecology Program (interim reports and completed short term studies, 24 in number) includes studies on insect ecology; movement of isotopes through the animal food web; element input through rainfall and subsequent distribution through the forest; recovery in irradiated areas; movement and distribution of previously applied radioisotopes in soil, plants and animals; and research in the Visiting Scientist Program. Increased emphasis will be placed on the physical and chemical properties of forest soils and the movement of macro- and trace elements via soil water to the stream. (Bopp-NSIC)
W72-00949

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1969,
Pacific Northwest Lab., Richland, Wash. Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
C. B. Wilson, and T. H. Essig.
Available from National Technical Information Service, as BNWL-1505, $3.00 in paper copy, $0.95 in microfiche; and as BNWL-1505 (App.), $3.00 in paper copy, $0.95 in microfiche. AEC Report BNWL-1505, 1970. 73 p, 21 fig, 17 tab, 30 ref; BNWL-1505 (App.) 1970. 120 p, 54 tab. AEC Contract AT (45-1)-1830.

Descriptors: *Nuclear wastes, *Food chains, *Phosphorus radioisotopes, *Water pollution effects, Columbia River, On-site investigations, Monitoring, Fish, Regulations, Absorption, Radioactivity effects, Mathematical models.
Identifiers: Radionuclide uptake.

At the Hanford plant, controlled releases of a variety of low-level radioactive wastes are made to the Columbia River, to the ground, and to the atmosphere. The major source of low-level wastes released to the environment in 1969 continued to be reactor cooling water discharge. The combined offsite effects of all radioactive wastes from Hanford were evaluated in terms of the radiation doses received by nearby populations. Dose estimates for the Maximum Individual and the Average Richland Resident (skeletal bone, whole body, gastrointestinal tract, and thyroid) were less than one-tenth of the appropriate standards with the largest percentage of standard being that for the skeletal bone (9% of the 1500 mrem/yr standard). A single radionuclide, P-32, contributed 92% of this estimated skeletal bone dose with Columbia River fish the major source of intake. A large part of the data is included in an appendix which is issued as a separate report. (Bopp-NSIC)
W72-00950

THE BIOLOGICAL COST OF DISCHARGING HEAT TO RIVERS,
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).
For primary bibliographic entry see Field 05B.
W72-00953

NUCLEAR USA - PEACEFUL USES OF ATOMIC ENERGY, VOL 1 AND 2, GENEVA, SWITZERLAND, SEPTEMBER 6-16, 1971.
International Conference on Peaceful Uses of Atomic Energy, Geneva (Switzerland).
For primary bibliographic entry see Field 03A.
W72-00954

RADIOACTIVE FOODCHAINS IN THE SUB-ARCTIC ENVIRONMENT. TECHNICAL PROGRESS REPORT, AUGUST 15, 1970-AUGUST 14, 1971,
Helsinki Univ. (Finland).
For primary bibliographic entry see Field 05B.
W72-00957

TRITIUM INCORPORATION IN ALGAE AND TRANSFER IN SIMPLE AQUATIC FOOD CHAINS,
Chicago Univ., Ill. Dept. of Biology; and Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W72-00958

PRELIMINARY ECOLOGICAL STUDIES AT JERVIS BAY,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
M. S. Giles.
Available from National Technical Information Service as CONF-710511-3, $3.00 in paper copy, $0.95 in microfiche. AEC Report CONF-710511-3 (From forty-third congress of the Australian and New Zealand association for the advancement of science; Brisbane, Australia, 24 May 1971). 22 p, 6 fig, 5 tab, 8 ref.

Descriptors: *Food chains, *Radioactivity effects, *Nuclear powerplants, Monitoring, Path of pollutants, Air pollution effects, Water pollution effects, Bays, Watersheds (Basins), Small watersheds, Crops, Eggs, Fisheries, On-site investigations, Environmental effects, Estuarine environment, Regulation, Fallout, Oysters, Mussels, Plankton, Marine algae.
Identifiers: Environmental statement, Critical nuclide pathway, Abalone.

Atmospheric critical nuclide pathways include honey production, water catchment, free-range egg production, backyard gardening, and collection of rainwater for drinking. Liquid-effluent pathways are seafoods (abalone, rock oysters, and dredge oysters), seaweed mulches, and agar products. The shallower waters will have the highest radioactivity since the warm effluent has relatively low density. This makes abalone, which spends several years in one (kelp) feeding area, a major pathway. Dredge oysters are another pathway, but large beds of rock oysters are not present. (Bopp-NSIC)
W72-00959

AMCHITKA BIOENVIRONMENTAL PROGRAM. AMCHITKA BIOLOGICAL INFORMATION SUMMARY,
Battelle Memorial Inst., Columbus, Ohio.
R. Glen Fuller.
Available from National Technical Information Service, as BMI-171-132, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report BMI-171-132, May 1971. 16 p, 1 fig, 18 ref. AEC Contract AT (26-1)-171.

Descriptors: *Radioactivity effects, *Environmental effects, *Nuclear explosions, Birds, Salmon, Sticklebacks, Crabs, Otters, Zooplankton, Phytoplankton, Mammals, Marine algae, Food chains, Marine fisheries, Lakes, Pollution abatement.
Identifiers: Radionuclide uptake.

Early in 1967, the United States Atomic Energy Commission Nevada Operations Office began a detailed evaluation of Amchitka Island in the western Aleutians as a potential site for underground nuclear testing. In October 1969, an underground test, Project Milrow, involved the detonation of a device of about 1 megaton yield, about 4,000 ft below the surface. Studies were designed to: (1) predict, document, and evaluate the effects of AEC testing activities on the environment; (2) recommend measures to minimize effects; and (3) predict radionuclide uptake by marine food chains, should there be an inadvertent release. Results are reported of studies of soils, vegetation, freshwater life, birds, and marine life. (Bopp-NSIC)
W72-00960

FISSION PRODUCT METABOLISM AND ... RADIOACTIVE CONTAMINATION OF THE FOOD CHAIN, PROGRESS REPORT JAN. 1, 1968 TO JUNE 30, 1969,
New York State Veterinary Coll., Ithaca.
C. L. Comar.
Available from the National Technical Information Service as NYO-4039-1, $3.00 in paper copy, $0.95 in microfiche. AEC Contract Report NYO-4039-1. 162 p. AEC Contracts AT (30-1)-2147 and AT (30-1)-4039.

Descriptors: *Nuclear wastes, *Fallout, *Food chains, Lakes, Lake fisheries, Milk, Crop production, Iodine radioisotopes, Strontium radioisotopes, Foods, Nuclear powerplants, Sites, Water pollution effects, Radioactivity effects, Water pollution control, Animal physiology, Metabolism, Nutrient requirements, Model studies, Ecotypes, Research facilities, Contract administration, Control.
Identifiers: Cesium radioisotopes.

Research is reported on radiation effects and applications; and on environmental radiocontamination as it affects reactor siting, agriculture, food technology, nutrition, radiation biology, and veterinary medicine. Nuclear Science Abstracts (number 24-2543) lists 16 separate abstracts for this report. The environmental studies followed three approaches: (1) application of fallout data to prediction of the effects of nuclear wastes on Cayuga lake, a proposed nuclear reactor site; (2) refinement of models for uptake of I-131, Cs-137 and Sr-90 from milk; (3) fallout studies (coding of all available data, study of I-131 from non-milk foods and of Sr-90 and Cs-137 from crops, and development of urinary sampling techniques for dietary Sr-90). (Bopp-NSIC)
W72-00962

FALLOUT STUDIES AND THEIR RELATIONSHIP TO THE GENERAL PROBLEM OF ENVIRONMENTAL RADIOCONTAMINATION,
New York State Veterinary Coll., Ithaca. Dept. of Physical Biology.
For primary bibliographic entry see Field 05B.
W72-00963

PREDICTIONS OF LONG DISTANCE RADIOACTIVITY AND RADIATION DOSES TO MAN IN 13 HYPOTHETICAL EXCAVATION APPLICATIONS,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 05B.
W72-00975

PRELIMINARY EVALUATION OF HYDROLOGIC FACTORS RELATED TO RADIOACTIVE WASTE STORAGE IN BASALTIC ROCKS AT THE HANFORD RESERVATION, WASHINGTON,
U. S. Geological Survey, Richland, Wash. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-00976

BIOLOGICAL CONCENTRATION AND TURNOVER OF RADIONUCLIDES IN FOOD CHAINS: A BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Div.
D. E. Reichle, D. J. Nelson, and P. B. Dunaway.
Available from the National Technical Information Service as ORNL-NSIC-89, $3.00 in paper copy, $0.95 in microfiche. AEC Report ORNL-NSIC-89 (ORNL-TM-2492), July 1971. 42 p.

Descriptors: *Food chains, *Mathematical models, *Radioactivity effects, Water pollution effects, Nuclear wastes, Public health, Metabolism, Toxicity, Bibliographies, Path of pollutants, On-site investigations, Ecosystems, Environmental effects, Radioactivity techniques, Radioecology.
Identifiers: Radionuclide uptake, Critical nuclide pathway.

The consequences of acute or chronic environmental contamination with radionuclides was assessed (Nuclear Safety 11 (1), 43-55, Jan.-Feb. 1970). In the preparation of this review, several hundred papers were reviewed, and those which were judged pertinent to the subject are included in the present bibliography since it was not possible to include them all in the original paper. The 196 references are listed alphabetically by the first author, and a 'Key Word in Context Index' of titles is included. (Bopp-NSIC)
W72-00977

INDEXED BIBLIOGRAPHY ON EFFECTS OF RADIONUCLIDES AND IONIZING RADIATION ON ECOLOGICAL SYSTEMS,
Oak Ridge National Lab, Tenn. Nuclear Safety Information Center.
G. U. Ulrikson, C. D. Bopp, and R. M. Carroll.
Available from the National Technical Information Service as ORNL-NSIC-95, $6.00 in paper copy, $0.95 in microfiche. AEC Report ORNL-NSIC-95, August 1971. 385 p.

Descriptors: *Path of pollutants, *Radioactivity effects, *Water pollution effects, Water pollution control, Radioisotopes, Nuclear wastes, Radioactivity techniques, Bibliographies, Food chains, Ecosystems, Mathematical models, Public safety, Environmental effects, Estuarine environment, Waste treatment, On-site investigations, Milk, Fish food organisms, Radioecology.
Identifiers: Radionuclide uptake, Critical nuclide pathway.

About 1700 titles (most from 1960-8) from a file maintained by the Lawrence Radiation Laboratory and, additionally, 800 references with abstracts (most from 1967-70) are included. Keyword and author indexes are included. The principal subject areas are critical nuclide pathways to man (through food chains including milk, fish, etc.) and radioactivity effects on ecosystems. Articles dealing principally with other aspects of environmental radioactivity (monitoring, meteorology, radionuclide release, and radioactivity effects on man) are omitted here; since they are included as separate categories in the Nuclear Safety Information Center cataloging system. (Bopp-NSIC)
W72-00978

EFFECT OF TYPE OF HOUSING AND LITTER ON PRODUCTION OF BROILERS,
Georgia Univ., Athens. Dept. of Poultry Science.
M. G. McCartney.
Poultry Science, Vol 50, No 4, p 1200-1202, July 1971. 2 tab, 8 ref.

Descriptors: *Air ventilation, *Consumptive use, *Efficiency, Disease, Chicken, Air contamination.
Identifiers: *Mortality, Enclosed housing, Open housing, White Plymouth Rock, Reused litter, Windowless type housing, Marck disease, Leukosis.

There has been considerable interest in the use of windowless-type houses for the production of broilers in the South. It is of general agreement that houses with fan ventilation are superior to the conventional house with respect to growth, feed conversion, mortality and condemnation of broilers to market age. The results of tests run to verify the hypothesis indicated that there were no real differences in the performance of broilers grown in open or enclosed housing or on new or old litter. Therefore, under the conditions of this study it is not possible to justify the cost of providing insulated, fan-ventilated housing for broilers. Also, since the type of litter did not affect condemnation, it is similarly not justified to recommend the use of new litter between successful lots of broilers from the standpoint of mortality or condemnations. (Bundy-Iowa State)
W72-00980

EFFECT OF VENTILATION ON THE GAS CONCENTRATION IN A PART-SLATTED PIGGERY,
North of Scotland Coll. of Agriculture, Aberdeen. Scottish Farm Buildings Investigation Unit.
A. M. Robertson, and H. Galbraith.
Farm Building Research and Development Studies, May 1971. 9 fig, 3 tab, 21 ref.

Descriptors: *Gases, *Hogs, *Ventilation, Effects, *Carbon dioxide, *Ammonia, *Hydrogen sulfide, Air circulation, Waste storage, Storage tanks, Environmental effects, Temperature, Toxicity, Animal physiology.
Identifiers: *Gas concentration, Slotted floor, Manure, Swine.

The concentrations of carbon dioxide, ammonia, oxygen, and hydrogen sulfide were recorded over the dung channel of a slatted floored house for growing/finishing pigs. Data was collected at ventilation rates varying from 0.262 m cu/h kg to 1.234 m cu/h kg live weight and during emptying of the channel. At summer ventilation rates concentrations of 7.6 ppm H2S, 9.1 ppm NH3 and 600 ppm CO2 were recorded. Concentration of toxic gases increased with volume of manure in the channel and depended on the ventilation rate. At winter rates concentrations in excess of 20 ppm H2S were recorded. (Parker-Iowa State)
W72-00985

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART I AND II.
Great Lakes Research Center, Detroit, Mich.
For primary bibliographic entry see Field 02H.
W72-01094

LASER INDUCED FLUORESCENCE IN RHODAMINE B AND ALGAE,
Syracuse Univ. Research Corp., N.Y.
G. Daniel Hickman, and Richard B . Moore.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 1-14, 1970. 11 fig, 2 tab, 22 ref.

Descriptors: *Algae, *Remote sensing, *Tracking techniques, Measurement, Currents (Water), Chlorophyll, Fluorescence, Bathymetry.
Identifiers: Laser, Rhodamine B.

Mapping of three-dimensional currents and of distribution of near-surface algae was investigated by recording fluorescence stimulated by the recently developed oceanic pulsed laser. A 3 nsec pulsed neon laser (540 nm) was employed to excite the emission of Rhodamine B (580 nm). The same laser was filled with nitrogen (337 nm) to stimulate the emission of algae. Rhodamine fluorescence was observed for concentrations as low as 0.1 ppb, whereas that from Anacystis and Chlorella species, from 6 to 12 mg/cu m. Airborne laser-receiver unit should detect the fluorescence from an altitude of 100 meters. (See also W72-01094) (Wilde-Wisconsin)
W72-01095

A MATHEMATICAL ANALYSIS OF THE NICHES OF LAKE MICHIGAN ZOOPLANKTON,
State Univ. of New York, Albany. Dept. of Biological Sciences.
Patricia A. Lane, and Donald C. McNaught.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 47-57, 1970. 6 fig, 2 tab, 29 ref.

Descriptors: *Niches, *Zooplankton, *Habitats, Lake Michigan, Analysis, Mathematical studies, Omnivores, Herbivores, Biological communities, Balance of nature, Daphnia.
Identifiers: Holopedium gibberum, Bosmina longirostris, Cyclops.

Niche analysis of limnetic plankton has indicated that congeneric species of Daphnia select habitats through vertical migration. The vertical migration, however, may not be the only mechanism for separating niches of omnivorous and herbivorous zooplankters. The persistent presence of Bosmina spp suggests that coexistence of Holopedium gibberum and Daphnia retrocurva is influenced by active resource allocation. Environmental heterogeneity and instability of populations are likely to handicap application of the niche theory. (See also W72-01094) (Wilde-Wisconsin)
W72-01096

BLUE-GREEN ALGAE AND HUMIC SUBSTANCES,
Cincinnati Univ., Ohio. Tanner's Council Lab.
Willy Lange.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 58-70, 1970. 4 fig, 6 tab, 17 ref.

Descriptors: *Cyanophyta, *Humic acids, Organic matter, Algae, Eutrophication, Chelation, Decomposing organic matter, Phytoplankton, Productivity, Iron.
Identifiers: *Fulvic acid, Growth stimulation, Anabaena, Gloeotrichia, Microcystis, Nostoc, Slaked lime.

A replacement of EDTA .. citrate in the Zehnder-Gorham media with synthetic fulvic acid increased greatly the cell numbers of Anabaena circinalis, Gloeotrichia echinulata, Microcystis aeruginosa, and Nostoc muscorum. The growth stimulation is attributed to chelating effects of fulvic acid and the resulting increased availability of iron and other trace elements. Results indicate that seepage of fulvic acid from raw humus and peat soils, or its release from sewage effluents play an important part in the nuisance growth of cyanophyta. Slaked lime is suggested as a partially efficient remedy for circum-neutral waters. (See also W72-01094) (Wilde-Wisconsin)
W72-01097

DISTRIBUTION OF FRESHWATER TRICLADS (PLATYHELMINTHES: TURBELLARIA) IN CENTRAL-SOUTHERN ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
D. F. Mettrick, M. J. Boddington, and S. R. Gelder.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 71-81, 1970. 4 fig, 3 tab, 29 ref.

Descriptors: *Worms, Benthic fauna, Distribution, Surveys, Water pollution effects.
Identifiers: *Triclads, Flatworms, Dugesia, Phagocata, Cura, Lake Ontario (Canada), Lake Simcoe (Canada), Niagara Escarpment (Canada).

Triclad flatworms are important as constituents of benthic fauna and as indicators of various ecological parameters. This survey of 95 collection sites in 12 watersheds identified four species: Dugesia polychroa, D tigrina, Phagocata morgani, and Cura foremanii. The distribution of species varied considerably within the watersheds, being influenced by the temperature range, nature of substrata, and level of pollution resulting from the mode of land utilization. (Wilde-Wisconsin)
W72-01098

SURVEY OF PHYTOPLANKTON PRODUCTIVITY AND NUTRIENTS IN LAKE MICHIGAN AND LAKE SUPERIOR,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
Claire L. Schelske, and Edward Callender.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 93-105, 1970. 5 fig, 5 tab, 15 ref.

Descriptors: *Phytoplankton, *Productivity, *Nutrients, *Lake Michigan, *Lake Superior, Eutrophication, Carbon, Nitrates, Nitrites, Surface waters, Diatoms, Cyanophyta, Ammonnia, Surveys.
Identifiers: Silicon dioxide, Bottom waters.

Water analyses, performed during cruises of the R/V 'Inland Seas,' yielded carbon fixation of 0.39 plus or minus 0.11 in Lake Superior, 3.19 plus or minus 1.8 in Lake Michigan, and 28 plus or minus 15 in southern Green Bay. The average concentration of nitrate nitrogen in the entire profile of Lake Superior was 269 ppb, whereas the surface and near bottom waters of Lake Michigan averaged 109 and 217 ppb, respectively. The average concentrations of silicon dioxide in surface waters were 1.87 in Lake Superior, and 0.15 in southern Lake Michigan and 0.26 ppb in northern Lake Michigan. Lake Michigan exhibited considerable impoverishment of its surface layer in N and Si due to utilization of these elements by phytoplankton. Differences between pH values and calcium contents of surface and near bottom waters were recorded in both lakes. The low concentration of silicon in Lake Michigan is attributed to accelerated eutrophication and subsequent multiplication of silicon-consuming diatoms. (See also W72-01094) (Wilde-Wisconsin)
W72-01099

A QUANTITATIVE METHOD FOR THE DETERMINATION OF CHLORIN PIGMENTS IN GREAT LAKES SEDIMENT,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
C. B. J. Gray, and A. L. W. Kemp.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 242-249, 1970. 2 fig, 3 tab, 13 ref.

Descriptors: *Chlorophyll, *Pigments, *Great Lakes, *Sediments, Organic matter, Degradation (Decomposition), Separation techniques, Measurement, Analytical techniques, Geochemistry.
Identifiers: *Chlorins, Pheophytin, Pheophorbide, Chlorophillide.

Ultrasonic extraction in an acetone-methanol mixture with subsequent concentration and separation by reverse-phase thin layer chromatography yielded quantitative determination of chlorophylls a, b, c, pheophytin a, b, chlorophyllides a, b, and pheophorbides a, b. The chlorins of each band were determined spectrophotometrically. Precision of the method is plus or minus 6%. Analyses of six surface sediments of Lakes Ontario and Erie provided the following results: chlorophyll a - 0 to 10 ppm, allomerized chlorophyll a - 0 to 1.3 ppm, pheophytin a - 3.6 to 7.4 ppm, pheophorbide a - 6.7 to 17.3 ppm. The absence of chlorophyll b suggested an autochthonous origin of organic matter at sampled stations. (See also W72-01094) (Wilde-Wisconsin)
W72-01100

NEUTRON ACTIVATION ANALYSIS OF SEDIMENTS IN WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Coll. of Biological Sciences.
Paul L. Zubkoff, and Walter E. Carey.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 319-325, 1970. 2 fig, 3 tab, 11 ref.

Descriptors: *Sediments, *Analytical techniques, *Neutron activation analysis, *Chemical analysis, Great Lakes, Eutrophication, Nutrients, Algae, Bacteria, Lake Erie, Aluminum, Manganese, Sodium, Chromium, Iron.
Identifiers: Vanadium, Lanthanum, Scandium.

The centers of 1 cm lateral sections of 15 cm sediment cores were washed free of interstitial water and subjected to a 2.0 x 10 cm 11 power neutron 0.01 cm 0.1 sec flux in research reactor. Analysis of gamma-ray spectra, obtained with a NaI (Tl) crystal, indicated a uniform concentration of Al, V, Mn, Na, La, Cr, and Sc. The contents of vanadium and chromium are at least three times as great as found in soils. (See also W72-01094) (Wilde-Wisconsin)
W72-01101

CIRCULATION PATTERNS AND A PREDICTIVE MODEL FOR POLLUTANT DISTRIBUTION IN LAKE ERIE,
New York State Univ., Buffalo.
John A. Howell, Kenneth M. Kiser, and Ralph R. Rumer.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 1, p 434-443, 1970. 7 fig, 1 tab, 6 ref.

Descriptors: *Water circulation, *Mathematical studies, *Probability, *Water pollution, Forecasting, Lake Erie, Model studies, Water quality control, Wind pressure.
Identifiers: *Pollutant distribution, Circulation effects, Transition probability matrix.

Distribution of pollutants in the Western Basin of Lake Erie for zero wind stress was outlined by use of the transition probability matrix (TPM) in conjunction with a physical model of the lake. The model predicted the steady state concentration in combination with the rotating lake model promises to facilitate the water quality management. (See also W72-01094) (Wilde-Wisconsin)
W72-01102

DRY WEIGHT OF THE MACROBENTHOS AS AN INDICATOR OF EUTROPHICATION OF THE GREAT LAKES,
California State Coll., Los Angeles. Dept. of Zoology; and Michigan Univ., Ann Arbor. Great Lakes Research Div.
Wayne P. Alley, and Charles F. Powers.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 595-600, 1970. 3 fig, 2 tab, 16 ref.

Descriptors: *Eutrophication, *Great Lakes, *Benthos, *Indicators, Biomass, Sampling, Amphipoda, Aligochaetes, Lake Superior, Lake Michigan, Lake Huron, Lake Erie.
Identifiers: *Macrobenthos, Chironomids, Sphaeriids.

The eutrophication levels of four Great Lakes were delineated on the basis of dry weight of macrobenthos, including amphipods, oligochaetes, sphaeriids, and chironomids. The following grand averages in g per sq m were established: Lake Superior - 0.9, Lake Huron - 1.48, Lake Michigan - 3.40, and Lake Erie - 4.63. In terms of Rawson's classification of Canadian lakes, Lake Erie is definitely eutrophic, Lake Michigan - moderately eutrophic, Lake Huron - mesotrophic, and Lake Superior - truly oligotrophic. (See also W72-01094) (Wilde-Wisconsin)
W72-01105

PLANKTON PRODUCTIVITY STUDIES IN LAKE ST CLAIR,
Windsor Univ. (Ontario). Dept. of Biology; and Wayne State Univ., Detroit, Mich. Dept. of Biology.
John M. Winner, J. Adrian, and Robert G. Ferguson.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 640-650, 1970. 4 fig, 3 tab, 17 ref.

Descriptors: *Plankton, *Productivity, *Phytoplankton, *Zooplankton, Cyanophyta, Hardness (Water), Nitrogen, Phosphorus, Runoff, Nutrients, Silica, Nitrates, Rotifers, Standing crop, Chlorophyll, Sampling, Chemical analysis, Eutrophication.
Identifiers: *Lake St Clair (Ontario), Chlorophyll a, Agricultural runoff.

Plankton population studies of Lake St Clair (Ontario) were accomplished by weekly sampling at two nearshore stations during May 31 - August 7, 1969. A relationship was established between community productivity and chemical properties of water, including alkalinity, hardness, and contents of N, P, and Si. A high content of nitrates (5 mg/l) indicated the influence of agricultural runoff. Cyanophyta, particularly Oscillatoria, dominated the phytoplankton. The zooplankton consisted predominatly of rotifiers, 19 species of which were recorded; Keratella cochlearis was the most abun-

dant. The lake exhibited a eutrophication level exceeding that of adjacent Lake Erie. The net productivity averaged 200 mg C/cu m per hour. (See also W72-01094) (Wilde-Wisconsin)
W72-01106

DISTRIBUTION OF TRACE ELEMENTS AND CHLOROPHYLL-A IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05B.
W72-01107

AQUEOUS PHOSPHATE AND LAKE SEDIMENT INTERACTION,
Great Lakes Research Center, Detroit, Mich.
R. C. Gumerman.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 673-682, 1970. 8 fig, 1 tab, 8 ref.

Descriptors: *Phosphates, *Sediment-water interfaces, Adsorption, Lakes, Nutrients, Lake Erie, Lake Superior, Laboratory tests, Temperature, Algae, Phosphorus, Ion exchange, Oxidation-reduction potential, Hydrogen ion concentration.
Identifiers: Sedimentary phosphorus release.

This laboratory study of sterile sediments from Lake Erie and Lake Superior disclosed that the phosphorus-sediment complex is formed under the influence of both physical and chemical adsorption. Maximum removal of aqueous P occurs within the pH range of 4.5 to 5.5. Lowering redox potential to zero may or may not effect a release of P from the sediment. The maximum adsorbing capacity of sediments is in surface layers less than 3.5 mm deep, and is zero at a depth exceeding 14 mm below sediment-water interface. As long as the sediment contains some adsorbed phosphorus, its release will maintain a minimum concentration of 0.1 mg/l of aqueous phosphate radical. In turn, under such conditions cessation of phosphate input may not effect a reduction of nuisance algal growth for a long time. (See also W72-01094) (Wilde-Wisconsin)
W72-01108

ENGINEERING CONSIDERATIONS OF A EUTROPHIC WATER BODY,
Syracuse Univ., N.Y. Dept. of Civil Engineering; and O'Brien and Gere Engineers, Inc., Syracuse, N.Y.
Peter E. Moffa, and Myrton C. Rand.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 693-706, 1970. 8 fig, 1 tab, 7 ref.

Descriptors: *Dissolved oxygen, *Monitoring, *Eutrophication, *Water pollution control, Lake Ontario, Trophic levels, Air pollution, Wastes, Hydraulics, Reaeration, Biochemical oxygen demand, Lakes, Phosphorus, Temperature, Water pollution sources.
Identifiers: *Onondaga Lake (NY), Total oxygen demand.

Determination of chemical and biological parameters was made at two stations in shallow, eutrophic Lake Onondaga (New York). Obtained information was incorporated in contour plots and used to establish the 'critical' TOD content and the volume of the lake effectively assimilating incoming TOD. These values permitted a determination of the reaeration rate and corresponding DO of the lake. Benthic and air pollution demands were taken into consideration. Percent dissolved oxygen saturation, plotted against influent TOD, indicated a significant increase in DO content with decrease in TOD. Lake Residence Equivalents, derived from measurements of influent streams, were used to evaluate the significance of minerals in precipitation of adsorption of phosphorus. Corresponding pollution abatement programs were appraised. (See also W72-01094) (Wilde-Wisconsin)
W72-01109

NUTRIENTS IN LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington, (Ontario). Canada Centre for Inalnd Waters.
M. T. Shiomi, and V. K. Chawla.
International Association for Great Lakes Research, Proceedings 13th Conference on Great Lakes Research, Part 2, p 715-732, 1970. 8 fig, 2 tab, 20 ref.

Descriptors: *Lake Ontario, *Nutrients, *Temperature, Spatial distribution, Phosphates, Nitrates, Silica, Phosphorus, Analysis, Eutrophication, Seasonal, Turbidity.
Identifiers: Factor analysis.

Horizontal and vertical monthly sampling of Lake Ontario at 60 stations was conducted from April 1969 to March 1970. Determinations included soluble phosphorus, total phosphorus, nitrates, ammonia, silicates, temperature, and turbidity. The distribution of nitrates, silicates, and soluble phosphates reflected the thermobiotic structure of the lake rather than input sources. Complete depletion of reactive phosphate was recorded during July in some parts of the epilimnion. The horizontal distribution of total phosphorus suggested inputs of the element. Factor analysis on a cruise by cruise basis yielded several inverse correlations between temperature, dissolved oxygen, and soluble nutrients. Total phosphorus was directly correlated with turbidity, indicating its affinity to particulate matter. (See also W72-01094) (Wilde-Wisconsin)
W72-01110

GULF INTRACOASTAL WATERWAY PROJECT, CARRABELLE TO ST. MARKS RIVER, FLA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-01120

5D. Waste Treatment Processes

UPPER TRINITY RIVER BASIN COMPREHENSIVE SEWERAGE PLAN, VOLUME I.
Camp, Dresser and McKee, Boston, Mass.

Report to the North Central Texas Council of Governments, July 6, 1970. 312 p, 36 fig, 73 tab. EPA BPG-3-68-12.

Descriptors: *Planning, *Sewers, *Waste water treatment, *Regional analysis, *Administration, Sewage treatment, Community development, Financing, Capital costs, Costs, Urbanization, Treatment facilities, Texas.
Identifiers: North-central Texas.

The objective was to prepare a plan for an area-wide comprehensive sewerage system and program for interceptor and trunk sewers and sewage treatment and disposal facilities in the North Central Texas region and to suggest methods for plan implementation. The output from this study is expected to be of great value not only to the North Central Texas Council of Governments (NCTCOG) but to all member communities in their planning for future development of the area. The 11,000 square mile study area includes all or part of 21 counties in North-Central Texas. For reasons of economics, centralization of responsibility, and administration of construction, operation and maintenance, six large joint-use treatment plants are proposed for sewage treatment in the metropolitan area of Dallas and Fort Worth. Each of these plants exists or is under construction at present. The people in the metropolitan area can expect the costs associated with intercepting sewers and sewage treatment to triple, based on 1970 estimates. For those people who live within the study area but outside of the metropolitan area of Dallas-Fort Worth described above, the aggregate construction costs of upgrading sewage treatment facilities between now and 1990, based on 1970 construction cost estimates, is about $50,000,000. Pollution control, infiltration control, and wastewater reuse are recommended. Means of implementing the recommendations of the comprehensive sewerage plan are presented. (See also W72-00641) (Poertner)
W72-00640

UPPER TRINITY RIVER BASIN COMPREHENSIVE SEWERAGE PLAN, VOLUME II.
Camp, Dresser and McKee, Boston, Mass.

Report to the North Central Texas Council of Governments, July 6, 1970. 225 p, 292 ref. EPA-BPG-3-68-12.

Descriptors: *Planning, *Sewers, *Waste water treatment, *Regional analysis, *Administration, Sewage treatment, Community development, Financing, Capital costs, Costs, Urbanization, Treatment facilities, Texas.
Identifiers: North-central Texas.

Nine appendices to Volume I of this report are included. The objective was to prepare a plan for an area-wide comprehensive sewerage system and program for interceptor and trunk sewers and sewage treatment and disposal facilities in the North-Central Texas region and to suggest methods for plan implementation. The output from this study is expected to be of great value not only to the North-Central Texas Council of Governments (NCTCOG) but to all member communities in their planning for future development of the area. The 11,000 square mile study area includes all or part of 21 counties in North-Central Texas. The publication includes: Texas water quality requirements, questionnaires for major wastewater treatment plants and for industrial waste information, existing trunk sewer data, soils legend, linear programming procedure, procedure for estimating low-flow augmentation requirements, glossary, and a comprehensive bibliography of 292 references. (See also W72-00640) (Poertner)
W72-00641

REGIONAL WATER AND SEWER NEEDS STUDY.
Southeastern Illinois Regional Planning and Development Commission, Harrisburg, Pa.

Available from the National Technical Information Service as PB-200 457, $3.00 in paper copy, $0.95 in microfiche. May 1971. 206 p, 9 fig, 18 tab, 44 ref. HUD No. Ill. P-297.

Descriptors: *Planning, *Water resources development, *Regional analysis, *Water demand, *Sewers, Municipal water, Municipal wastes, Rural areas, Treatment facilities, Community development, Urbanization, Water supply, Reservoir storage, Sewerage, Administration, Priorities, Financing, Illinois.
Identifiers: Water needs, Sewer needs.

Water resources development needs and the results of a survey and analysis of municipal water and sewer facilities of a five-county region in southeastern Illinois are discussed. The study reveals that: (1) an inadequate water supply base exists in several portions of the region; (2) only nine of the 16 communities which have municipal water systems also have municipal sewerage, there by creating serious waste water disposal problems; (3) several communities will unlikely be able to satisfy the State's sewage treatment facility modernization deadlines of July 1972; (4) eight of the 16 municipalties which lack municipal sewerage appear precluded by reasons of size, finances, and geography from ever acquiring it; (5) 24 of the region's 25 municipalities will likely possess public water supplies by 1980 or shortly thereafter; and (6) problems relative to municipal utility administra-

tion are prevalent in much of the region. The study enumerates several regional goals and objectives, the most important of which include: (1) development of the principal potential water supply reservoirs in the region; (2) promotion of the development of additional and improved municipal water and sewer systems; and (3) adoption by municipalities of utility extension policies and more efficient utility management procedures. Also included in the study are water and sewer project priority categories for use by the regional planning commission. (Poertner)
W72-00643

SEWER FACILITIES.
Elam and Popoff, Glen Rock, N.J.

Available from the National Technical Information Service as PB-200 573, $3.00 in paper copy, $0.95 in microfiche. County Planning Board, County of Bergen, Hackensack, New Jersey, Final Report June 1970. 35 p, 2 fig, 8 tab. HUD P-125.

Descriptors: *Planning, *Sewers, *Waste water treatment, *Community development, *Sewage treatment, Sewerage, Administration, Financial analysis, Capital costs, Cities, Urbanization, Treatment facilities, New Jersey.
Identifiers: Bergen County (NJ), Comprehensive plan.

Wastewater collection and disposal problems in Bergen County were analyzed. Approximately 80 percent of the population and 40 percent of the land area within the County are served by 44 existing sewerage systems. The remaining 20 percent of the population, or over 180,000 people, had individual sewage disposal systems. Nine of the 44 are major systems, with 3 regional, 2 joint-use and 4 municipal serving all the population and, with the exception of the Ford Motor Company, all the major industry in the County. The remaining 35 have small treatment plants, generally of the packaged type, serving primarily schools, shopping centers, apartment houses, restaurants and local industries. Regional needs and a master plan for providing regional wastewater facilities is proposed. Various alternative solutions are described based upon population projections in Bergen County, including its 70 municipalties. Design criteria are suggested for the various elements of the sewerage system. The master plan comprises four regional service areas. The overall concept of the plan is discussed including: administration, availability of financial aid and cost estimates. Recommendations are given for means of establishing the plan as a tool of the County for meeting the wastewater collection and disposal needs of its municipalties. (Poertner)
W72-00645

ANALYSIS OF COMPREHENSIVE WATER SUPPLY AND SEWAGE DISPOSAL STUDIES.
Ulster County Planning Board, Kingston, New York.

Available from the National Technical Information Service as PB-200 816, $3.00 in paper copy, $0.95 in microfiche. June 1971. 19 p. HUD: N.Y.P. No. 223.

Descriptors: *Planning, *Water resources development, *Regional analysis, *Water demand, *Sewers, Municipal water, Municipal wastes, Treatment facilities, Community development, Urbanization, Water supply, Reservoir storage, Sewerage, Administration, Priorities, Financing, Hudson River, Aqueducts, Septic tanks, Soil disposal fields, New York.
Identifiers: Ulster County (NY).

Comprehensive water supply and sewerage studies and recommendations of two consulting engineering firms retained by New York State to study conditions in Ulster County were analyzed. Ground water supplies are being polluted in some areas by improperly functioning septic tanks and disposal fields. The soil in Ulster County is mostly unsuitable for sewage disposal by this method. The only alternatives appear to involve spreading the population over the countryside at low densities, or constructing municipal sewerage and water supply systems. Sources investigated to obtain adequate water supplies until the year 2020 were groundwater, the Hudson River, new impoundments, and the New York City Aqueducts. The County Planning Board feels that tapping the aqueducts is preferable; however, if this proves impossible, the Board would not hesitate to use Hudson River water for long term needs. The Board favors a regional approach rather than the development of separate municipal systems. Financing appears to be the major obstacle. The assimilative capacities of streams in the County will be reduced in future years. Therefore it will be necessary to employ tertiary wastewater treatment in many areas. The problem of water for sewerage assimilation is just beginning in Ulster County. New riparian legislation by the State is needed if chaos is to be avoided. In addition, population limits will likely be needed to maintain the ecological balance of the County. Greater federal and state subsidies are recommended to finance the extension of trunk line sewers beyond boundaries of existing municipal sewer districts. (Poertner)
W72-00646

WATER AND SEWER SERVICE AREAS.
Central Connecticut Regional Planning Agency, New Britain.

Available from the National Technical Information Service as PB-200 285, $3.00 in paper copy, $0.95 in microfiche. Staff Paper No 14, April 30, 1971. 24 p, 3 fig, 1 tab. HUD No. Conn. P-123.

Descriptors: *Planning, *Water resources development, *Regional analysis, *Water demand, *Sewers, Municipal water, Municipal wastes, Treatment facilities, Community development, Urbanization, Water supply, Sewerage, Connecticut.

Information is summarized by the Central Connecticut Regional Planning Agency in its effort to study the appropriate staging of water and sewer system service area developments. This staff paper is to serve as an aid to the municipalties in the Region in working toward the adopted goal of coordinating the design, location, timing and services of utilities with current and projected private developments. Accurate maps were prepared of the water supply service areas and the sewerage service areas. The future requirements for water, sewage collection and water pollution control in the Region are described. The municipalties included are Berlin, Bristol, Burlington, New Britain, Plainfield, Plymouth and Southington. The total water demand for the Region in the years 1990 and 2020 are 13.96 mgd and 26.74 mgd respectively. The total possible water available from surface supplies is 9.6 mgd and the balance will probably have to come from ground sources. Consequently, water supply in this Region is relatively assured to the year 2020. (Poertner)
W72-00647

GENERAL PLAN FOR WATER AND WASTEWATER SYSTEMS.
Chino Basin Municipal Water District, San Bernardino, Calif.

Available from the National Technical Information Service as PB-199 694, $3.00 in paper copy, $0.95 in microfiche. West Valley Planning Agency, San Bernardino County, California, 1969. 123 p, 22 fig, 26 tab, 98 ref. HUD.

Descriptors: *Planning, *Water resources development, *Regional analysis, *Water demand, *Sewers, Municipal water, Treatment facilities, Community development, Urbanization, Water supply, Sewerage, Administration, Water transfer, Water reuse, California.
Identifiers: San Bernardino County (Calif).

The study was made as part of the development of an area-wide water and sewer facilities plan for the area having essentially the same boundaries as the Chino Basin Municipal Water District. The basic approach used in the preparation of this report was to investigate the optimum utilization of the West Valley area's total water resources in meeting that area's future water demands. Economics and water quality were important considerations of that investigation. A necessary ingredient to the completion of the analysis was a determination of the optimum disposal of the area's wastewater. It was estimated that the population of this area will increase from 256,000 to 900,000 persons by the year 2020 and that annual water requirements will increase from 196,000 to 330,000 acre-feet by the year 2015. The principal category of water use will be municipal, with lesser amounts required for industry, agriculture and stock-grazing. Sewer service to the study area is provided on a non-regional basis by eight organizations empowered to do so, plus several non-municipal organizations. The CBMWD recommended that a single public authority should manage the water resources for the West Valley area. Maximum utilization of the area's ground water resources was recommended, as well as reclaimed wastewater for direct re-use or basin replenishment. A single regional agency was also recommended to control and manage all wastewaters tributary to sewers within the study area. (Poertner)
W72-00648

COBB COUNTY SEWERAGE IMPROVEMENT PROJECT, GEORGIA-ENVIRONMENTAL IMPACT STATEMENT.
Environmental Protection Agency, Atlanta, Ga.

Available from the National Technical Information Service as PB-198 858F, $3.00 in paper copy, $0.95 in microfiche. July 28, 1971. 186 p, 5 fig, 1 tab, 14 ref.

Descriptors: *Planning, *Water pollution control, *Sewers, *Waste water treatment, *Environmental effects, Environmental engineering, Sewage treatment, Waste water disposal, Recreation facilities, Water quality control, Urbanization, Conservation, Georgia.
Identifiers: *Environmental impact statement, Cobb County (Georgia).

Cobb County, Georgia has proposed a plan for construction of a new and improved means of wastewater conveyance and treatment along the Chattahoochee River. This facility will replace some smaller, existing, municipally-owned and privately-owned plants which are proving to be inadequate. The river serves as a public sport and recreation facility for the citizens of the region. Care will be taken during construction to preserve the natural landscape and environmental balance. The project will improve the quality of the water in the Chattahoochee River and its streams and ponds almost immediately, and is designed to satisfy water pollution control requirements for a fifty year period. A Draft Environmental Impact Statement was developed and distributed to federal and state environmental agencies for their formal review and comment. The primary issue identified was the proposal to run the interceptor facilities through the Cobb County palisades. This area is naturally scenic and may have the possibility for reclamation as a natural wilderness area. A solution is that the project as described in the statement be constructed. It will substantially improve water quality in the region, establish a principle of cooperative county planning, and preserve to the greatest possible extent the natural landscape. The short-range impact, resulting from construction, will be minimized and should cause no long-term defacement of the natural habitat. (Poertner)
W72-00649

THE TREATMENT OF METAL-SALTS CONTAINING WASTE WATER,
Chemisch und Biologisches Laboratorium, Essen (West Germany).
W. Bucksteeg, and N. Wolters.

Water Research, 4 (9): 581-607. Illus. 1970.
Identifiers: Industrial, Metal, Methods, Salts, Toxification, Wastes, Waste water.

In 1966 only 15% of all metal plating shops and enterprises in West Germany were equipped to purify the metal-salt containing waste water from enterprises; quality of the treated water was unsatisfactory in 2/3 of the cases, as established by 3570 analyses of waste water from 108 galvanic enterprises. This result is attributed to a neglect in creating reaction conditions which are required for the quantitative removal of metals from solutions. The conditions under which galvanic waste waters are formed (metal ore preparation, electrolysis, surface treatment of metals, metal-salts in industrial waste waters with organic pollutants), the precipitation of metals (solubility of hydroxides), stability of metal salt complexes, separation and removal of hydroxide sludge, detoxification of waste waters containing cyanide (oxidation of cyanide), detoxification of waste waters containing chromium salts (precipitation as chromate, reduction in acid solution, reduction in alkaline solution) and the purification of galvanic waste water using ion exchange resins are described.--Copyright 1971, Biological Abstracts, Inc.
W72-00652

THE BARRIER ROLE OF MODERN WATER WORKS IN RESPECT TO CHEMICAL INGREDIENTS, (IN RUSSIAN),
S. N. Cherkinskii, L. N. Gabrilevskaya, V. P. Laskina, and M. N. Rubleva.
Gig Sanit. 35 (11): 15-18. Illus. 1970. English summary.
Identifiers: Barrier, Chemical, Filtration, Flocculation, Ingredients, Model, Sedimentation, Toxic, Waste water, Works.

In an experimental plant, modelling such processes of water treatment as flocculation, sedimentation and filtration, the extent of elimination of various toxic substances was studied. Ordinary methods of water treatment produce a considerable fall in the concentration of both organic and inorganic compounds in water.--Copyright 1971, Biological Abstracts, Inc.
W72-00657

TRACE ELEMENT REMOVAL FROM SEWAGE EFFLUENT BY SOIL FILTRATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
G. S. Lehman, and L. G. Wilson.
Water Resour Research, 7 (1): 90-99. Illus. 1971.
Identifiers: Effluent, Element, Filtration, Lysimeter, Sewage, Soil, Trace.

The concentrations of Fe, Mn, Ni, Cu, Zn, Pb, and Cd in a domestic sewage effluent were effectively reduced during percolation through about 8 ft of calcareous soil material contained in lysimeters. Sr concentrations were not reduced by similar filtration. Co and hexavalent Cr were not present in the effluent in quantities detectable by atomic absorption spectrophotometry. In a field study conducted on large plots over a 3 yr period, larger quantities of Fe, Mn, and Cu in the filtrate indicate the possible saturation of the soil with several trace metals in a relatively short period of time.--Copyright 1971, Biological Abstracts, Inc.
W72-00659

LIGHT INTENSITY AND THE VERTICAL DISTRIBUTION OF ALGAE IN TERTIARY OXIDATION PONDS,
North Carolina Univ., Chapel Hill.
William R. Hartley, and Charles M. Weiss.
Water Research, 4 (11): 751-763. Illus. 1970.
Identifiers: Algae, Algal, Distribution, Euglena-Rostifera, Intensity, Light, Mat, Migration, Oscillatoria-Tenuis, Oxidation, Ponds, Surface, Tertiary, Vertical, Weir.

Studies on the use of oxidation ponds for the tertiary treatment of municipal waste waters showed that solar heating results in thermal stratification. Under these conditions there is probable short circuiting of flow. Installation of weirs to minimize stratification by forcing an under-over flow pattern was followed by the development of 2 distinct algal associations as a result of the skimming action of the surface weir. Upstream of the surface weir a thick algal mat developed which consisted of an interlocking complex of cysts of Euglena rostifera and filaments of Oscillatoria tenuis. Downstream of the skimming weir, the surface of the pond was free of the mat but deep green in appearance. This color was due to a population of a single species, E. rostifera. The green color of the clear pond areas was observed to change considerably in intensity in the course of the diurnal cycle. Detailed investigation of this phenomena revealed a vertical migration rhythm of the Euglena associated with the diurnal cycle. Examination of the diurnal migration and associated factors showed that: the Euglena moved from the bottom sludge, where it settles at night to levels in the pond where light intensity measurements did not exceed 75 c/sq ft; diurnal temperature changes did not affect the vertical migration of Euglena; and under the algal mat, consisting of O. tenuis and encysted E. rostifera, there was no vertical migration. Isolation and growth of single cell isolates of E. rostifera showed that optimum growth was at the same light intensity range found in the ponds where the maximum populations were located. At higher light intensities the proportions of chlorophylls a, b, and c decreased and carotenoid pigments increased. Growth in total darkness produced complete loss of chlorophylls but also a sharp increase in carotenoid pigments.--Copyright 1971, Biological Abstracts, Inc.
W72-00660

SETTLING CHARACTERISTICS OF SEWAGE IN DENSITY CURRENTS,
Birmingham Univ. (England). Dept. of Civil Engineering.
M. J. Hamlin, and A. H. Abdul Wahab.
Water Research, 4 (9): 609-626. Illus. 1970.
Identifiers: Coleshill, Currents, Density, England, Flow, Pattern, River, Settling, Sewage, Thames.

The work reported by March and Hamlin (1966) of a full scale investigation at the Coleshill works of the Upper Thames Main Drainage Authority is extended. The earlier work indicated the importance of the density difference between the tank contents and the sewage entering the tank, on the sedimentation efficiency of a settling basin. This work concerns a laboratory investigation into the effects of these density differences both on the flow patterns within a tank and on the removal efficiencies. In the laboratory density differences were controlled by temperature differentials and removal efficiency was calculated from an idealized settling curve.--Copyright 1971, Biological Abstracts, Ind.
W72-00663

NITROGEN REMOVAL AND IDENTIFICATION FOR WATER QUALITY CONTROL,
Washington Univ., Seattle. Dept. of Civil Engineering.
Dale A. Carlson.
Available from National Techinal Information Service as PB-204 231, $3.00 in paper copy, $0.95 in microfiche. August 15, 1971. 52 p, 12 fig, 8 tab, 85 ref. OWRR A-040-WASH (1).

Descriptors: *Nitrification, *Denitrification, Water quality control, Eutrophication, Activated sludge, Design, Nitrogen, Diffusion, *Algal control, Aeration, *Waste water treatment.
Identifiers: *Ion-selective cathodes.

Removal of nitrogen from waste water systems by biological nitrification and denitrification in an activated sludge system is considered. One of the major methods proposed for controlling excess algal production in receiving waters, the process consists of aerating activated sludge mixed liquor solids for detention times sufficient for nitrifying bacteria to oxidize ammonia to nitrate. The mixed liquor then goes to an anaerobic denitrification zone where the nitrate is biologically converted to nitrogen gas. Pilot plant studies preceding the current studies are discussed prior to presentation of the work on pure culture kinetic studies and development of ion selective cathodes for identification of nitrogen fractions. For the conditions used, the rate of denitrification by Pseudomonas denitrificans followed the Michaelis pattern, not being inhibited by high concentrations of CH3COONa as the substrate. The theoretical maximum rate of denitrification (V) was about 10 micron 1N2/hr/mg bacterial cell and the theoretical value of Ks was 5.8 mM with a cell concentration of 3400 mg/l. The obtained Ks value promises a reasonable rate of denitrification under the given conditions. Although the rates denitrification at the various KNO3 concentrations did not follow the Michaelis pattern, inhibiting effects of nitrate were not observed at KNO3 concentrations as high as 8.0 mM/l. The use of ion selective cathodes for detecting ions such as the nitrogens was investigated. It appears that the selectivity of ion-selective cathodes can be increased greatly by the addition of time dependent retarding voltages.
W72-00800

QUALITY CONSIDERATIONS IN SUCCESSIVE WATER USE,
Colorado Univ., Boulder. Dept. of Civil Engineering; and Colorado University, Dept. of Environmental Engineering.
K. D. Linstedt, E. R. Bennett, and S. W. Work.
Journal of Water Pollution Control Federation, Vol 43, No 8, p 1681-1694, August, 1971. 2 fig, 7 tab, 17 ref.

Descriptors: *Boiler feed water, *Irrigation, *Potable water, *Industrial water, *Water quality control, *Water reuse, *Colorado, *Water supply, *Waste water treatment, Disinfection, Nutrients, Microorganisms, Organic wastes, Comparative costs, Cooling water, Economic feasibility.
Identifiers: *Denver (Colorado), *Waste water treatment systems, Dissolved inorganic wastes, Suspended solids.

Reuse of municipal wastewater can solve the problems of water pollution and diminishing sources of new water supply. Water quality criteria were established for three main water uses, irrigation, industrial, and potable, and a sampling and testing program conducted on the Denver, Colorado, supply water and wastewater effluent systems. Wastewater effluent quality was compared to the various water use standards to indicate the degree of treatment necessary for upgrading it to a satisfactory level for various uses. Reuse-removal increments, the constituent removals necessary to meet standards in each use class, were established. Advanced waste treatment systems for the removal of nutrients, suspended solids, organic substances, dissolved inorganic substances, and microorganisms as well as disinfection are discussed. In addition, schemes indicating the degree and cost of treatment necessary to renovate water for irrigation, boiler feed, cooling systems, and potable use are presented. The significant difference in quality requirements and renovation cost estimates for the various uses illustrates the economic feasibility of coupling water quality to the quality demands of each reuse application. (Haugh-Wisconsin)
W72-00866

HIGH-ENERGY RADIATION SYNTHESIS OF OZONE FOR WATER TREATMENT,
Brookhaven National Lab., Upton, N.Y.
M. Steinberg, and M. Beller.
Isotopes and Radiation Technology, Vol 8, No 4, p 420-428, Summer, 1971. 4 fig, 6 tab, 27 ref.

Descriptors: *Sewage treatment, *Ozone, *Radiation, *Water treatment, *Potable water, Cobalt radioisotopes, Comparative costs, Strontium radioisotopes, Disinfection, Electric power industry, Aquatic microbiology, Pilot plants.

Identifiers: *Chemonuclear-reactor process, Cesium radioisotopes, Radioisotopic radiation, Chemical industry.

Ozone for treating sewage-plant secondary effluent or drinking water can be produced in a high-pressure radiation facility which yields two to three times as much as the low-pressure electric-discharge process. A cost analysis shows that for up to 400 tons/day of ozone the optimum chemonuclear cost is half that of the electric-discharge cost. Since increasingly large volumes of sewage (10 to the 8th power to over 10 to the 9th power gal/day) will require treatment, further development of a cost-saving chemonuclear process of synthetic ozone production is indicated. (Haugh-Wisconsin)
W72-00867

MODEL STUDY OF ROTARY VACUUM FILTRATION,
Sheffield Univ. (England). Dept. of Fuel Technology and Chemical Engineering.
M. G. Perry, and B. Dobson.
The Chemical Engineer, April 1970. p 83-87, 7 fig, 8 ref.

Descriptors: *Sludge treatment, *Vacuum drying, Concentration, Slurries, *Model studies, Laboratory tests, Electrical resistance, Flow rates, Flow, *Filtration, *Waste water treatment.
Identifiers: Diatomite filter aid, Filter cake build up.

Although undoubtably an important step in many industrial processes, rotary vacuum filtration has not received much attention from research workers. Because of a lack of knowledge about the manner in which the filter cake builds up and the influence of parameters such as solids concentration and pressure drop on the cake behaviour, the correct action to take is not always obvious in many situations. A model filter cell was constructed which allowed the investigators to study the development of the filter under conditions of two solids concentration and filtration vacuums between 10 cm Hg and 40 cm Hg. A diatomite filter aid was used to simulate the solids content of a sludge to be dewatered. This experimental arrangement provided, on a continuous basis, accurate, reproducible measurements of flow-rate, total flow, cake thickness, and resistivity over times similar to those used on continuous rotary vacuum drum filters. This enabled a study of all stages of filtration and the resistivity measurements provided an insight into the manner in which filter cakes form. (Goessling-Texas)
W72-00899

AIR STRUCTURE SPEEDS SLUDGE DRYING,
City Manager's Office, Abilene, Kans.
K. G. Bittel.
Public Works, Vol 101, No 1, p 84-85, January 1970. 3 fig.

Descriptors: *Sludge, *Drying, Temperature, Economic analysis, Construction costs, *Sludge treatment, *Waste water treatment, Kansas, Air temperature.
Identifiers: Air inflated structure, *Abilene (Kan).

The city of Abilene has always had the problem of insufficient bed area for drying treated sludge. Slow drying during wet weather or during cold weather compounded the problem. Drying times of three to four months were not uncommon during the winter. The city was able to resolve this problem by constructing an air structure over the sludge beds. Construction costs were $0.75 per square foot covered versus $3.00 per square foot for a 'pole barn'. The vinyl covered nylon material is cloudy, however, light transmission is nearly 100%. Drying times have been reduced to approximately five weeks. Experience to date indicates that temperatures of 30 to 50 degrees above ambient can be expected during daylight hours. These temperatures quickly approach ambient after the sun goes down. The sludge is removed at night to avoid the high temperatures. Two blowers are used to maintain an inside air pressure of 5 pounds per square foot, one is driven by a 1 1/2 hp electric motor and the other requires a 5 hp motor. The structure has withstood winds to 50 mph and gusts to 60 mph. The manufacturer feels confident that winds of up to 100 mph can be tolerated. Repairs are easy to make using glue and patches of the same material as the structure. There have been no odor problems associated with this operation since its inception. (Goessling-Texas)
W72-00901

A COMPREHENSIVE ENVIRONMENTAL APPROACH TO MARINE WASTE DISPOSAL PLANNING,
Brown and Caldwell, San Francisco, Calif.
For primary bibliographic entry see Field 05E.
W72-00902

WHAT'S NEW IN WATER AND SEWER PIPE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 08F.
W72-00903

STORA-BROBY RECOVERY PROCESS FOR SEMICHEMICAL PULP MILLS,
Stora Kopparbergs Bergslags A.B., Falun (Sweden). Centrallaboratoriet.
B. Lunden.
Technical Association of the Pulp and Paper Industry, Vol 53, No 9, p 1726-1731, Sept 1970, 4 fig, 3 tab, 3 ref.

Descriptors: Water quality, *Air pollution, Pulp and paper industry, *Sulfite liquors, Chemicals, Chemical reactions, Water reuse, *Pulp wastes, Industrial wastes, Pollution abatement, Waste water treatment.
Identifiers: Hydrogen sulfide, Sulfur dioxide, Recovery processes.

The Stora-Broby process for recovery of chemicals from spent liquors at sodium-based, high yield pulp mills is a combination of a furnace developed at the Scania Cellulose Co. Broby Mill and a modification of the Stora process for chemical conversion. The weak liquor from the pulp mill, which has been concentrated to 20-25% in an evaporator, is further evaporated by hot flue gasses from the smelter in a direct contact evaporator, to a concentration suitable for burning in the smelter. The green liquor which results is clarified and carbonated with pure carbon dioxide. In this step hydrogen sulfide is stripped from the green liquor and is carried to a Claus reactor where it reacts with sulfur dioxide to form elemental sulfur. Residual CO_2 is recirculated to the carbonating tower for reuse. In this way, green liquor is converted to sodium bicarbonate, which is reacted with sodium bisulfite to produce sodium sulfite and gaseous CO_2. Part of the sulfite is reacted with SO_2 to produce sodium bisulfite to maintain this loop of the conversion process. It is questionable whether this process will ever pay for itself by the amounts of chemicals conserved or returned. However, in view of the ever increasing stringency of pollution laws, the recovery of these chemicals from the liquid and gaseous effluents may mean the survival of the plant. (Goessling-Texas)
W72-00904

CONCEPTS OF COAGULATION,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
Thomas M. Keinath.
Paper presented at, 'New Developments in Textile Waste Treatment' Seminar, College of Industrial Management and Textile Science, Clemson University, May 31-June 4, 1971. 29 p, 20 fig, 2 tab, 17 ref. OWRR A-012-SC (5).

Descriptors: *Coagulation, *Separation techniques, *Zeta potential, Colloids, Clays, Bound water, Cations, Anions, Sedimentation, Chemical precipitation, Iron, Aluminum, *Waste water treatment, *Reviews.
Identifiers: *Literature review, Hydrophobic, Hydrophilic.

A review of the coagulation theory was conducted to tie together the various theories being proposed at present. Analysis of the forces acting upon colloidal particles in a solvent demonstrated that the only parameter subject to outside control was particle size. Coagulation efficiency depends to a large extent on the magnitude of the charge which each colloid possesses. A colloid gathers counter ions about itself and becomes stabilized, so the object in coagulation is colloid destabilization, allowing colloids to come in contact and coalesce. The major models of colloid destabilization by: (1) indifferent electrolytes; (2) chemical bridging; and (3) coagulation with alum and iron are discussed in depth, considering varying physical and chemical conditions. (Lowry-Texas)
W72-00905

WHAT YOU SHOULD KNOW ABOUT THE DESIGN OF HIGH RATE TRICKLING FILTERS,
Genesee County Drain Commission, Flint, Mich.
W. J. Benzie.
Public Works, Vol 100, No 4, p 77-80, April 1969, 4 fig.

Descriptors: *Trickling filters, Biochemical oxygen demand, Nitrification, Efficiencies, Design, Performance, *Waste water treatment, *Filtration.
Identifiers: High rate loading, Multiple stages, Recirculation, Suspended solids.

High rate trickling filters are those in which some portion of the filter discharge is returned to the influent of the primary sedimentation tank or to the filter influent. Plants can be designed for any degree of treatment between sedimentation and complete treatment. High rate filters are usually dosed at 5 to 10 times the rates employed on standard filters, and with careful design, they can produce an effluent as low in suspended solids and BOD as a standard filter but with little evidence of nitrification. BOD loadings of 2,540 to 3,000 pounds per acre-foot per day are common. Staging can be accomplished by dividing the required volume of media between the several stages called for in the design. A flexible recirculation program will allow the skilled operator to operate at the desired point to maintain effluent quality. Formulas for the calculation of performance of these filters are given and discussed. To obtain the predicted performance, intelligence must be used in the selection of materials and equipment and in obtaining a qualified operator. Filter media, underdrains and rotary distributors are important and specifications should leave nothing to chance. Correctly sized recirculation pumps are also very important. Experience has demonstrated that properly designed, constructed and operated high rate trickling filter plants can meet the design specifications. (Goessling-Texas)
W72-00906

CONCEPTS OF WASTEWATER REUSE,
Environmental Protection Agency, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
F. M. Middleton.
Water and Sewage Works, Vol 118, Ref No 1971. p R/59-R/62, 13 ref.

Descriptors: *Water reuse, *Waste water treatment, *Water quality control, Separation techniques, Desalination, Ion exchange, Irrigation, By-products, Legislation, Groundwater recharge.

Many areas with water shortage have already resorted to re-use of treated wastewater effluent in order to augment their water supplies. Water re-use usually begins with industries who discover that municipal effluent is suitable and less costly than treated potable water for cooling purposes. As ef-

fluent quality improves due to improvements in waste treatment facilities, the effluent becomes suitable for more and more industrial functions. However, industries may consume only 5% of the intake water of the community. Other logical uses of treated effluent include agricultural irrigation, and irrigation of recreational lands. The next logical step is groundwater recharge. Augmenting of the water supply with treated effluent dilutes the effluent and provides increase flow in the aquifers. Direct re-use is possible and safe, but aesthetic objections have so far prevented it from becoming a reality. Technology has provided man with the ability to re-use water, but it is up to the individual areas to obtain the most benefit from their water at the least possible cost. (Lowry-Texas)
W72-00907

MODERN CONCEPT OF DISINFECTION,
Public Health Service, Cincinnati, Ohio. Bureau of Water Hygiene.
For primary bibliographic entry see Field 05F.
W72-00908

DESIGN AND OPERATION OF ADSORBER SYSTEMS,
Clemson University, S.C. Dept. of Environmental System Engineering.
Thomas M. Keinath.
Presented at 'New Development in Textile Waste Treatment' Seminar, College of Industrial Management and Textile Science, Clemson University, May 31-June 4, 1971. 18 p, 17 fig, 8 ref. OWRR A-012-SC (4).

Descriptors: *Activated carbon, *Adsorption, *Mathematical models, Design criteria, Flow rate, Density, Porosity, Mass transfer, Equilibrium, Phenol, Separation techniques, *Waste water treatment.
Identifiers: *Film diffusion, *Carbon columns, Langmuir, Isotherm, Hexanol, Sodium laurel sulfate.

Recent usage of adsorption, following coagulation, flocculation, and sedimentation, as a substitute for conventional primary secondary wastewater treatment has indicated impending widespread application of adsorption. A review of available contact modes was conducted, and the mechanisms, including fixed and expanded beds in both batch and continuous operations, discussed. The equilibrium approach to calculating carbon capacity is presented as a useful, time saving approximation, but only the unsteady state approach, discussed in detail, provides an accurate picture. The eight parameters necessary to numerically evaluate the concentration-time profile include: (1) volumetric flow rate; (2) influent concentration; (3) adsorbent bed density; (4) adsorbent bed porosity; (5) adsorbent bed volume; (6) the film-diffusion mass transfer coefficient; and (7) and (8) the two Langmuir equilibrium constants. An example problem is presented. The model is then applied to multiple-solute heterogeneous systems to demonstrate its usefulness as a design tool. (Lowry-Texas)
W72-00909

TREATMENT OF SUPERNATANTS AND LIQUIDS ASSOCIATED WITH SLUDGE TREATMENT,
Texas Univ., Austin. Dept. of Environmental Health Engineering.
J. F. Malina, Jr., and J. DiFilippo.
Water and Sewage Works, Vol 118, Ref No 1971. p R/30-R/38, 2 fig, 7 tab, 43 ref.

Descriptors: *Sludge treatment, *Anaerobic digestion, *Waste water treatment, Ammonia, Carbon dioxide, Nutrients, Phosphorus, Nitrogen, Filtration, Vacuum drying, Aeration, Centrifugation.
Identifiers: *Digester supernatant, *Wet air oxidation, Stripping, Elutriation.

All sludge treatment processes result in a supernatant liquor containing suspended solids, oxygen consuming substances, and nutrients. Problems which have been attributed to re-cycle of digester supernatant include sludge bulking, odors, increased chloride demand for prechlorination, primary tanks, becoming septic, and increased nutrient load on receiving waters. Supernatant liquors vary according to type of sludge treatment used (anaerobic digestion, centrifugation, vacuum filtration, etc) and concentration of sludge (the more concentrated the sludge the smaller the volume of supernatant). One more promising method of supernatant liquor treatment presently availabel includes chemical coagulation, clarification, and stripping, with the relatively small volume of supernatant liquor, compared to the plant influent, suggesting individual treatment. Other suggested methods included aeration, vacuum filtration, lagooning, flotation, and elutriation. (Lowry-Texas)
W72-00910

OZONE TREATMENT OF SEWAGE PLANT ODORS,
Welsbach Corp., Philadelphia, Pa. Ozone Systems Div.
P. C. Unangst, and C. A. Nebel.
Water and Sewage Works, Vol 118, Ref No 1971, p R/42-R/43, 3 fig, 4 ref.

Descriptors: *Ozone, *Odors, *Oxidation, Turbulence, Mixing, Ventilation, Automatic controls, Cost analysis, Waste water treatment.
Identifiers: On-site generation, Exhaust.

Ozonation systems have been developed for in-plant odor control applications. Ozone controls odors arising from various sewage plant locations by oxidizing the sulfides and amines produced to sulfoxides and amino oxides, both of which are odorless and non-toxic. The odor producing facility must be covered, having only one exhaust outlet. There must be a minimum of 15 sec. of mixing time between the exhaust gas and the ozone to insure good oxidation and odor removal, assuming that the exhaust fans provide sufficient turbulence and mixing. Proper control of ozonator output can be achieved so that gasses leaving the exhaust stack contain less than 0.01 mg/l of ozone, a safe level for continuous exposure. On-site ozone generation units have been developed which are capable of being fully automated and interlocked with other equipment. Maintenance consists of simple cleaning twice annually. Operating costs for units producing from 4 to 200 lb/day of ozone are about 10 kwh/lb ozone produced. Exhaust flow can be easily determined since one lb/day of ozone is adequate to treat 6,000 cfm of exhaust. (Lowry-Texas)
W72-00914

CLASSIFICATION OF ORGANICS IN SECONDARY EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Sanitary Engineering Lab.
M. Rebhun, and J. Manka.
Environmental Science and Technology, Vol 5, No 7, p 606-609, July 1971, 2 fig, 2 tab, 19 ref.

Descriptors: *Waste water treatment, *Sewage effluents, Tertiary treatment, Physicochemical properties, Chemical reactions, Organic acids, Carbohydrates, Proteins, *Water reuse, Effluents, *Organic wastes.
Identifiers: Fractionization, Ether extractables, Anionic detergents.

The increase of pollution in existing fresh water sources and the need to reuse wastewater in many parts of the world are focusing attention on more efficient methods of contaminant removal. Effluents from the common biological treatment processes contain considerable amounts of organics. A study has been conducted to determine the composition of soluble organics in secondary effluents. A fractionation procedure was applied enabeling recovery and quantitative determination of humic substances as well as other chemical groupings present in these effluents. This procedure made possible the classification of the total organic content of the effluents. Forty to 50% of the organics was classified as humic substances (humic, fulvic and hymathomelanic acids), the fulvic acid being the major fraction of this class. The remainder of the organic matter consisted of: ether extractables-8.3%; anionic detergents-13.9%; carbohydrates-11.5%; proteins-22.4%; and, tannins-1.7% (the percentages being approximate). To obtain more knowledge about the so-called humic substances and other organics isolated from secondary effluents, further studies are underway to determine the structure of these substances as well as their fate in physicochemical treatment processes. (Goessling-Texas)
W72-00916

WEYERHAEUSER'S TREATMENT OF PULP AND PAPER WASTES AT THE PLYMOUTH, NORTH CAROLINA COMPLEX,
Weyerhaeuser Co., Plymouth, N.C.
G. S. Bailey.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 742-749, 2 fig, 3 tab.

Descriptors: *Waste water treatment, *Pulp wastes, Water quality, Legislation, *Settling basins, Automatic control, Data collection, Economic analysis, Dissolved oxygen, *Biochemical oxygen demand, Self purification, North Carolina, *Aeration, *Oxidation lagoons.
Identifiers: In-plant control, Extended aeration, *Roanoke River, Plymouth (NC).

In the later 1950's the Weyerhaeuser mill at Plymouth, North Carolina embarked on a program to reduce the BOD loading on the Roanoke River which receives the treated effluent of the mill. These improvements included in-plant changes to reduce wastes and an aerated lagoon for treatment of condensate and pulp mill white water. In 1965, new treatment facilities were selected for advanced treatment. Extended aeration combined with primary treatment, and settling ponds was selected for this improvement. Preliminary calculations indicated a requirement for seven days aeration time and seven days holding or storage before discharge. A total of 500 acres was used for the aeration basin and two settling ponds operated in series. Fifteen floating aerators of 50 hp each were used initially and later four additional aerators added for a total of 950 hp. The system is connected by a series of lift stations. The system is monitored, to an extent, automatically with visual and audible signals to indicate equipment failures. Automatic water quality monitoring devices are permanently installed upstream and downstream from the plant. These data combined with data collected manually five days a week during the low flow periods provide a good estimate of the impact of effluent discharges on the river. The performance of the system has been gratifying. The BOD loadings on the river have been reduced more than enough to maintain river water quality. (Goessling-Texas)
W72-00920

HYDROLYSIS OF CONDENSED PHOSPHATES IN WASTEWATER,
Toronto Univ. (Ontario).
G. W. Heinke, and J. D. Norman.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 644-654, 4 fig, 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Phosphates, *Hydrolysis, Rates, Sewage, Activated sludge, Temperature, Hydrogen ion concentration, Enzymes, Laboratory tests, Sewage effluents, Bacteria.
Identifiers: Natural water, Distilled water, Tripolyphosphates, Pyrophosphate, Orthophosphate.

The chemical industry has carried out many studies on the rate of hydrolysis of condensed phosphates in distilled water. However, few investigations have

been made of this effect in natural water and waste water. A study has been conducted to determine the rates of hydrolysis of sodium tripolyphosphate and to a lesser extent sodium pyrophosphate in wastewater under conditions of temperature, pH, and concentration levels occurring in the environment. The rate of hydrolysis increases by a factor of 110,000 as the temperature increases from freezing to boiling. The hydrogen ion concentration decreases the rate of hydrolysis by 1,000 as the pH decreases from 14 to zero. Enzyme activity can increase the rate by as much as 10 to the 6th power0. The rate of hydrolysis is roughly proportional to the concentration of the phosphates. Experimental studies indicated that contact with the bacteria in activated sludges increased the rate of hydrolysis by a factor of 50 over than in untreated wastewater. The results of this work will be of value to research on phosphorus removal methods. Based on literature data and this work, the rate of hydrolysis of sodium tripolyphosphate in activated sludge, wastewater, algal cultures, natural water and distilled water decreases in the order given. Quantitative data given will allow an order of magnitude prediction of rates. (Goessling-Texas)
W72-00922

BASIC OXYGEN PROCESS WATER TREATMENT,
Inland Steel Co., East Chicago, Ill.
J. R. Brough, and T. F. Voges.
Proceedings, Industrial Waste Conference, 24th, May 6, 7, and 8, 1969. p 762-769, 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Air pollution, *Steel, Alkalinity, Hardness, Dissolved solids, Sulphates, Suspended load, Hydrogen ion concentration, Cooling towers, Corrosion, Scaling, Water reuse, Sludge disposal, Vacuum drying.
Identifiers: *Basic oxygen furnace.

The need for water in the operation of the Basic Oxygen Furnace (BOF) arises mainly from the necessity to clean the gasses evolved during the steel making operation in order to prevent air pollution. There are five major water systems and each of these systems has different water quality and treatment requirements. These systems are: (1) Hood Cooling; (2) Oxygen Lance Cooling, (3) Spark Box Spray Cooling; (4) Gas Scrubbing, and, (5) Gas After Cooling. The hood cooling water treatment consists of adding biocide for slime and algae control, sulphuric acid for pH control and a zinc-organic compound for prevention of scale and corrosion. Because of the severe temperature conditions in the oxygen lance system, high quality water is necessary to avoid scale deposits or sedimentation in the cooling passages. Boiler feed water is used to satisfy the water quality standards. Water is used in the Spark box to remove large particulates and to cool the gasses. Efforts to recycle this water back through the Spark box proved unsatisfactory and these waste waters are piped to the scrubbers for use there. The exhaust gasses from the Spark box are passed through a quenching tower where they are further cooled and a second opportunity is available for the separation of large particles. Venturi gas scrubbers are used for the final gas cleaning step. Prior to release, the gas is cooled to 160 deg. F in a cooling tower. Ninety percent of the water used in the BOF is for gas cleaning. (Goessling-Texas)
W72-00923

REMOVAL OF COLOR AND ORGANIC MATTER FROM KRAFT MILL CAUSTIC EXTRACTION WASTE BY COAGULATION,
South Carolina Univ., Columbia. Coll. of Engineering.
N. E. Tejera, and M. W. Davis.
Technical Association of the Pulp and Paper Industry, Vol 53, No 10, p 1931-1934, 10 fig, 1 tab, 16 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Organic matter, Pulp and paper industry, *Coagulation, Aluminum, Iron, Color, Total organic carbon, Settling velocity, Laboratory tests, Chemical reactions, Hydrogen ion concentration.

Wastes from the caustic extraction process amount for about 90% of the total color found in the bleaching process, making an independent study of this effluent desirable. Several investigators have studied various chemical coagulant aids to determine their effectiveness in removing color. A laboratory study was initiated to extend the studies of Al (III) and Fe (III) as coagulant aids in treating caustic extraction wastes. Compounds of these strong positive ions in concentrations of from .003 M to 1.4 times .02 M were used for the removal of color and TOC from these wastes. Values of pH from 2 to 10 were used, with NaOH and HCl used for pH adjustment. Approximately 96.6% of the color and 85% of the TOC were removed when either AlCl3 or FeCl3 was used as a coagulant. Optimum pH for removal was lower for Ferric iron than for aluminum. Both coagulants were about 12 times more effective for bleachery caustic extraction wastes than for bleachery chlorination waste. The presence of sulphate ions was found to decrease the efficiency of both color and TOC removal. Studies of the rate of settling of the floc resulting from coagulation indicate that the floc is voluminous and slow settling. (Goessling-Texas)
W72-00924

A CONTINUOUS COAGULATION MONITOR FOR WATER CLARIFICATION CONTROL,
Arkansas Univ., Fayetteville.
Charles McLaughlin, Larry Weir, Mike Bishop, and George Brower.
Paper Presented at Arkansas Water Works and Pollution Control Conference and Short School, 40th, April 20, 1971. 21 p, 6 fig, 22 ref. OWRR A-016-ARK (1).

Descriptors: *Flocculation, *Automatic control, *Monitoring, *Turbidity, Colloids, Zeta potential, Bound water, Sludge, Hydrogen ion concentration, Alkalinity, Pressure, *Waste water treatment, Water purification, *Coagulation.

Plant models, with numerous intermediate modifications, were constructed to aid in the development of a continuous coagulation monitor. The first model failed due to short circuiting problems, dictating the construction of a second and third model consisting primarily of a flocculation chamber and a tube settler. Coagulant and alkalinity were added in solution form by means of a peristaltic pump and hydrodermic needles. Model 3 allowed four different systems of flocculation chambers and tube settlers to be dosed and operated simultaneously. This unit was field tested and alkalinity, turbidity, and pH of the raw water, the plant settled water, and the effluents from each of the 4 tubes were recorded. A fifth model was constructed using six channels to provide maximum variability. By identifying effluent quality with some measureable parameter, such as turbidity, dynamic coagulation control can be achieved. (Lowry-Texas)
W72-00925

THE FUNGAL ECOLOGY OF SEWAGE LAGOONS IN TUSKEGEE ALABAMA,
Tuskegee Inst., Ala.
Emily J. Dilworth.
Master's Thesis, September 1970. 55 p, 7 fig, 9 tab, 28 ref. OWRR B-015-ALA (1).

Descriptors: *Fungi, *Oxidation lagoons, *Bacteria, Pathogenic fungi, Yeasts, Toxicity, Inhibitors, Sampling, Monitoring, Hydrogen ion concentration, Temperature, *Waste water treatment, Water quality control, Alabama, *Sewage lagoons.
Identifiers: *Penicillium, *Aspergillus, *Tuskegee (Ala).

Samples were both inlets and outlets of two sewage lagoons in Tuskegee, Alabama were analyzed for total fungi and different types of fungi every month for one year. The types of fungi found in the lagoons included: Aspergillus Spp., Penicillium Spp., Yeast Spp., Mucor Spp., Rhizopus Spp., Fusarium Spp., Trichoderma Spp., Geotrichium Spp., and Paecilomyces Spp. During the low temperature winter months, a general increase in the number of fungi was observed. This increase was attributed to lower pH levels and less nutritional competition from the depleted bacterial species, as well as the lowered temperature. During the warmer months, bacterial levels again increased, pH increased, and a drop was observed in fungal levels. Of the fungi, Penicillium, Aspergillus, Trichoderma, and Mucor grew well during the winter whereas Yeast, Geotrichum, and Fusarium were discouraged. The growth of Paecilomyces followed no detectable pattern. These results indicated different environmental conditions produce quite different growth rates for the different fungi. (Lowry-Texas)
W72-00926

EVALUATION OF A PROPRIETARY WASTE TREATMENT SYSTEM ABOARD THE USCGC ALERT (WMEC-630) BASED AT CAPE MAY, NEW JERSEY,
Coast Guard, Cape May, N.J. Applied Technology Div.
C. L. Schaller, T. S. Scarano, and O. M. Halstad.
Report, May 1971. 23 p, 11 fig, 4 ref. DOT-CG-81, 344-A.

Descriptors: *Ships, Prototype tests, *Waste water treatment, Sedimentation, Filtration, *Aeration, Disinfection, Chlorination, Sampling, Laboratory tests, Pumps, Biochemical oxygen demand, Oxidation, Turbulence, Mixing.
Identifiers: *Suspended solids, Comminution, Vacuum aeration.

A shipboard sewage treatment system, consisting of: (1) hydraulic comminution; (2) Vacuum aeration; (3) settling tanks; (4) chlorine storage tank; (5) chlorine contact/ejection tank; (6) three pumps; (7) two air compressors and compressed air storage tanks; and (8) a control panel, was installed aboard a 210' Coast Guard Cutter. Influent to the unit consisted of sanitary, galley, scullery, shower and lavatory wastes plus below water level deck drain discharges, containing mean BOD5 and suspended solids concentrations of 954 and 793 mg/l respectively. Average, daily hydraulic loading was 5000 gallons, or three times the design loading. As a result, only 72% BOD and 40% suspended solids removals were obtained, well below the desired levels. Chronic materials problems were encountered with the metal comminuter screen, settler screen, and backflush filter, largely the result of corrosive deterioration and metal fatigue. Within this system, filtration of suspended solids was not an effective removal mechanism. (Lowry-Texas)
W72-00928

THE FOOD INDUSTRY'S INVOLVEMENT IN ENVIRONMENTAL CONCERNS,
National Canners Association, Washington, D.C.
Alvin H. Randall.
Preprint of paper presented at the Water Pollution Control Federation Conference, 44th, San Francisco, Calif, Session 6, No 1, October 5, 1971. 9 p.

Descriptors: *Canneries, *Industrial wastes, Fruit crops, Vegetable crops, Fish, *Water quality control, Planning, Sampling, Monitoring, Water reuse, Cost analysis, *Waste water treatment.

Food canning plants are located in nearly every part of the country, and provide about 15% of an average person's annual food supply. Length of the production season may vary from as short as 30 days to year-round operations. The industry is characterized by the large number of businesses having low or marginal profitability, making them extremely susceptible to irreparable damage from 'crash' environmental control programs. In 1913, a research laboratory was established by the National

Canners Association to investigate the following: (1) reduction of fresh water requirements; (2) segregation of selected waste streams; (3) modification of in-plant processes to minimize generation of waste end products; (4) improved methods of treatment and disposal of liquid wastes; (5) improvements in effluent monitoring and control; (6) education of plant personnel in pollution abatement measures; and (7) cooperative research programs to develop waste treatment procedures. Specific goals for 1975 are also presented as extensions of work currently being performed. (Lowry-Texas)
W72-00929

TREATMENT OF COMBINED SEWER OVERFLOWS UTILIZING SCREENING/DISSOLVED AIR FLOTATION,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
Donald G. Mason.
Preprint, presented at the Water Pollution Control Federation Conference, 44th, San Francisco, Calif, Session 4, No. 1, October 1971, 18 p, 9 fig, 6 ref.

Descriptors: *Screens, *Flotation, *Storm runoff, *Separation techniques, Pilot plant, Coagulation, Flocculation, Chlorination, Disinfection, Cost analysis, Water quality control, *Waste water treatment.
Identifiers: *Combined sewer overflows, *Suspended solids.

A 5 mgd pilot plant was constructed in Milwaukee, Wisconsin to evaluate the effectiveness of a screening/flotation treatment scheme for treatment of combined sewer overflows (CSO). Review of the literature revealed that most of the pollutants in CSO are in the form of particulate matter and would thus be particularly suited for screening/flotation treatment. Effluent quality generally comparable to secondary effluent was obtained from operation of the pilot plant. 20 mg/l of ferric chloride and 4 mg/l of Dow C-31 (a cationic polyelectrolyte) provided effective chemical treatment while the screening/flotation unit also provided sufficient detention time for adequate chlorination. Capital costs for a 90 mgd facility, based on costs derived from the pilot plant experience, were estimated at $21,000 per mgd capacity. Operating costs were estimated for the same facility to be 3.09 cents/1000 gallons. (Lowry-Texas)
W72-00931

SLUDGE BARGING TO SEA.

Public Works, Vol 101, No. 4, p 65-66, April 1970.

Descriptors: *Waste disposal, *Waste water treatment, *Sludge disposal, *Industrial wastes, Incineration, Landfills, Toxicity, Permits, Legislation.
Identifiers: *Ocean dumping, Innovations.

Earlier this year, the Governor of the State of New Jersey issued an emergency order to commandeer tugs to tow barges filled with sewage sludge to sea for dumping. The direct cause of this emergency was a strike by tug-boat operators. The Governors message called for: (1) begin phasing out ocean dumping of sewage sludge and toxic industrial materials; (2) until adequate land disposal facilities can be developed, restrict all ocean dumping to at least 100 miles at sea; (3) incorporate sludge disposal facilities, other than ocean dumping, into all new designs for wastewater treatment plants; (4) establish a requirement for an interim ocean dumping permit that each applicant show that steps are being taken to develop alternate means of disposal; and (5) coordinate with other states and communities to obtain their agreement with these proposals. The governor indicated that he was aware of the potential hazards of land disposal of sludge and toxic materials and called for innovative approaches to alleviate these problems. (Goessling-Texas)
W72-00932

OXIDATION OF SEWAGE WITH AIR AT ELEVATED TEMPERATURES,
Water Pollution Research Lab., Stevenage (England).
W. J. Fisher.
Water Research, Vol 5, p 187-201, 1971, 5 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Carbon, *Oxidation, *Sewage, Temperature, Pressure, Laboratory tests, Autoclaves, Economic analysis, Eutrophication, Nitrogen, Ammonia, Ships, Inland water waterways.
Identifiers: *Excess air, Lower fatty acids.

Chemical oxidation with air at elevated temperatures has been used in the U.S.A. as a means of treating sewage sludges with reasonably good results. The possibility of oxidizing raw sewage with air at elevated temperatures has been studied in the laboratory. Autoclaves with capacities of 1 and 3.5 l were used to maintain temperatures up to 400C. Oxygen transfer from the excess air into the sewage was facilitated by rocking the autoclaves. Most of the carbon compounds were oxidized quite rapidly at the higher temperatures; this was confirmed in experiments with solutions using the individual compounds. The residual carbonaceous matter consisted mainly of the lower fatty acids, primarily ascetic acid. Nitrogen in the sewage was broken down only as far as ammonia. The effect of this process on phosphous was not studied. The costs for such a system appears quite large in view of the amounts of sewage to be treated. Such a process might be desirable on board ships used in enclosed waters where sewage discharges can be most harmful, and where the ships engineers are adapted to high temperature and high pressure processes. (Goessling-Texas)
W72-00933

ANAEROBIC DIGESTION OF THICKENED SLUDGE,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
A. Shindala, and T. G. Byrne.
Public Works, Vol 101, No. 2, p 73-76, February 1970, 3 fig, 2 tab, 17 ref.

Descriptors: *Anaerobic digestion, *Waste water treatment, *Sludge digestion, *Anaerobic conditions, Temperature, Heat, Economic analysis, Laboratory tests, Alkalinity, Hydrogeon ion concentration.
Identifiers: Mesophilic, Thermophilic, Volatile acids, Gas production, Volatile solids destruction.

As much as 30 to 50 percent of the total operating cost of a sewage treatment plant is utilized in sludge digestion. Laboratory experiments have been conducted to determine if anaerobic sludge digestion can be improved by operating the digesters at thermophilic temperatures. One gallon wide mouth jars were used as digesters. Seed sludge was taken from a primary digester at a local sewage treatment plant and raw sludge was taken from the underflow from the primary sedimentation basin of the same plant. Sludge was thickened to 15% solids in a low speed centrifuge. The digesters were operated at temperatures of 105, 120, 130 and 140 degrees F. It was found that increasing the digestion temperature from 95 to 105 degrees F increased gas production and that beyond 105 degrees deterioration in sludge digestibility occurred. Alkalinity and volatile acid concentrations increased as digestion temperatures increased. It is postulated that gas yields per unit of volatile matter from thickened sludges may still be adequate due to decreased heat requirements. The volume of gas produced should be judged in the light of the destruction of volatile matter, heat requirements and quality of gas produced. (Goessling-Texas)
W72-00935

A NON-GUIDE TO FILTER SELECTION FOR LIQUIDS,
Purchas (D. B.), Woking (England).
D. B. Purchas.
The Chemical Engineer, p 79-82, April 1970, 4 tab, 9 ref.

Descriptors: *Waste water treatment, *Filters, Waste identification, Effluents, Particle size, Particle shape, Slurries, Suspended load.
Identifiers: Filter cake, Wash waters.

The point which it is desired to bring out in this article is this: desirable though a concise selection guide may be, filtration is far too complex a subject to be compressed into the confines of a brief article, especially if adequate account is to be taken of the industrial context within which the operation occurs. The technical literature already contains a fair number of 'guides to filter selection', of varying quality and utility. Of course, the ideal guide to filter selection would surely be in tabular form; but in spite of a variety of different tables devised by different authors, no adequate system has yet emerged unless hedged around by lengthy pages of supporting text. Even then, the result is often a 'check list' to jog the memory of those with a high degree of knowledge rather than a genuine guide upon which the less informed can place much reliance. The root cause of these failures to produce a comprehensive but concise 'guide to filter selection' is that they have attempted the impossible. Nonetheless, the charts reproduced here, from these authors, have a certain utility; but they must be used with circumspection. (Goessling-Texas)
W72-00936

MUNICIPAL WASTEWATER TREATMENT BY PHYSICAL AND CHEMICAL METHODS,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. V. Villers, E. L. Berg, C. A. Brunner, and A. N. Masse.
Water and Sewage Works, Vol 118, Ref. No. 1971. p R/62-R/81, 5 fig, 7 tab, 13 ref.

Descriptors: *Adsorption, *Coagulation, *Waste water treatment, Activated carbon, Sedimentation, Chemical precipitation, Lime, Turbidity, Phosphorus, Nitrogen, Sludge disposal, Incineration, Pilot plants, Sampling, Biochemical oxygen demand, Chemical oxygen demand, Cost analysis.
Identifiers: *Carbon regeneration, *Lime recalcination, Suspended solids, Total organic carbon, Municipal waste water.

A lime clarification and adsorption system was studied on a 0.1 mgd scale at Lebanon, Ohio. Results averaged over a 9 million gallon throughput of weak to moderate strength domestic wastewater in steady flow showed an effluent TOC of 11 mg/l with an overall range of 2-23 mg/l. Product turbidity averaged less than 2. Phosphate and suspended solids removals were consistently 90% or better. System response to changes in flow rates and strengths of influent was not determined. Cost estimates using the data obtained were $.05/1000 gal of wastewater treated on a once through carbon basis, and possibly less than $.01/1000 gallons if the carbon is regenerated. From these and other cost estimates, it was determined that at plant sizes above 10 mgd, physical-chemical treatment plants would cost less to build but more to operate. Below 10 mgd, conventional plants would be more economical in both categories. However, added costs of conventional plants for removal of phosphorus were neglected. Several other innovations, such as centralization of carbon regeneration and lime recalcination facilities may make the process more economically competitive. (Lowry-Texas)
W72-00937

BACTERIAL CHANGES IN TWO SELECTED SEWAGE LAGOONS AT TUSKEGEE AND THEIR RELATION TO BIOCHEMICAL OXYGEN DEMAND AND DEHYDROGENASE ACTIVITY,
Tuskegee Inst., Ala.
Herbert C. Barden.

Master's Thesis, September 1970, 54 p, 13 fig, 10 tab, 36 ref. OWRR B-015-ALA (2).

Descriptors: *Sewage lagoons, *Aerobic bacteria, *Anaerobic bacteria, *Actinomycetes, *Sewage bacteria, Fungi, Hydrogen ion concentration, Temperature, Sampling, Microbiology, *Waste water treatment, Water quality control, Biochemical oxygen demand.
Identifiers: *Microbial balance, *Dehydrogenase activity, Lagoon efficiency.

The inlets and outlets of two sewage lagoons near Tuskegee, Alabama were samples on a monthly basis for one year. These samples were then analyzed for total aerobic bacteria, anaerobic bacteria, and actinomycetes to study the microbial balance during sewage treatment, and the factors effecting the balance. Samples were also analyzed for BOD and dehydrogenase activity, to compare the popular BOD determination with dehydrogenase activity in study lagoon efficiencies. Aerobic bacteria generally increased during summer months while anaerobic bacteria generally decreased, but no definite pattern or relationship between environmental conditions (temp., pH) was observed. Actinomycetes were intermediary between aerobes and anaerobes with definite changes, but, again, no definite pattern. Dehydrogenase activity correlated well with both BOD and bacterial numbers. Dehydrogenase activity, being faster, less complex, and more sensitive than the BOD test, was recommended as possibly being a better method for checking lagoon efficiency. (Lowry-Texas)
W72-00938

THE USE OF A RUBBLE CHIMNEY FOR DENITRIFICATION OF IRRIGATION RETURN WATERS,
Stanford Univ., Palo Alto, Calif.
For primary bibliographic entry see Field 08H.
W72-00974

LIQUID MANURE FOR MIDWEST SWINE PRODUCTION,
Illinois Univ., Urbana. Dept. of Agricultural Engineering. Liquid Manure for Midwest Swine Production,
D. G. Jedele.
Transactions of ASAE, Vol 2, No 1, 1959, p 9-10. 6 fig.

Descriptors: *Farm waste, *Swine, Septic tank, Sewage lagoons, Liquid waste, Irrigation, Confinement pens, Animal disease, Liquid wastes, Waste disposal.
Identifiers: *Tank wagon, *Spreaders, Storage tank, Material handling, Hand scraping.

With the trend of raising swine in confinement, renewed interest in liquid manure disposal is being created. The primary method used by Illinois swine producers is the collection of liquid manure in storage tanks, and then the disposal by tank wagon on crop land. The finishing floors are normally on slopes varying from 1/4 inch per foot to one inch per foot. The methods of cleaning floors range from hand scraping followed by water rinsing to high pressure water rinsing only. For hand scraping combined with rinsing about 1/4 gal. of water per hog is required. For high pressure rinsing about 1/2 gal. of water per hog is required. For computing capacities for storage tanks, a minimum of 2 gal. per hog per day is suggested. Up to this time most spreading equipment is homemade. The spreader used ranged from 6 ft. to 20 ft. spread per swath. (Bundy-Iowa State)
W72-00979

FUMIGATION AND REUSE OF BROILER LITTER,
Hawaii Univ., Honolulu. Dept. of Animal Science.
E. Ross, and A. Y. Miyahara.
Poultry Science, Vol 50, No 4, p 1096-1100, July 1971. 4 tab, 12 ref.

Descriptors: *Bacteria, Poultry, Disease, Feeds, Bactericide, Microorganisms.
Identifiers: *Methyl bromide, *Mortality rate, Reused litter, Coccidia, Concentration, Weight gain, Sterilized poultry litter, Broilers, Soil, Fumigant, Build up litter.

The scarcity of conventional litter material in some parts of the country is an increasing concern to broiler producers. The effect of methyl bromide fumigation of reused litter on chicken growth, feed conversion and mortality was investigated as a possible solution. To test these effects 6 trials on commercial broiler chicks were made. In 6 trials, commercial broiler chicks were reared on fresh wood shavings litter, reused wood shavings litter and reused wood shavings litter that had been fumigant with 1-10 kg. of methyl bromide/20.5 m.2 of litter. Increasing levels of fumigant reduced the bacterial count in the litter without achieving sterilization and without otherwise affecting weight gains, feed conversion or mortality. (Bundy-Iowa State)
W72-00981

LIVESTOCK WASTES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. R. Miner.
Journal Water Pollution Control Federation, Vol 43, No 6, June 1971, p 991-998. 60 ref.

Descriptors: *Farm wastes, *Waste disposal, *Reviews, Waste treatment, Publications, Gases, Odors, Soil disposal fields, Aerobic treatment, Aeration, *Reviews, Bibliographies.
Identifiers: *Livestock wastes, *Literature review, Feedlot runoff.

This is a review of the literature on research in the area of livestock waste management and its influence on water quality. Discussions include waste treatment systems, waste characteristics, manure handling systems, gases and odors, application of wastes to cropland and cattle feedlot wastes. A short review of sixty references in this area is given. (Parker-Iowa State)
W72-00988

BASIC POINTS TO CONSIDER IN MANURE DISPOSAL PROBLEMS,
Richard D. Chumney.
Poultry Digest, December 1970, p 608.

Descriptors: *Farm wastes, *Poultry, *Waste disposal, Regulation, Costs, Environmental effects, Technology.
Identifiers: Recycling.

The greatest deterrent to future progress of the U.S. poultry industry is the lack of technological and managerial know-how for proper and efficient disposal of poultry waste. In approaching the problem the following points should be considered: (1) Regulatory enforcement should not exceed the present 'state of the art.' (2) The cost of waste disposal must be included as a regular cost of doing business. (3) New techniques for the recycling of poultry waste into the soil and as feed supplements is the best long range approach. (4) Every precaution must be taken to protect our total environment as we dispose of poultry waste. (Parker-Iowa State)
W72-00989

SULFUR BACTERIA IN RED LAGOONS,
Nebraska State Dept. of Health, Lincoln. Div. of Environmental Engineering.
O. Sletten, and R. H. Singer.
Journal Water Pollution Control Federation, Vol 43, No 10, October 1971, p 2118-2122. 27 ref.

Descriptors: *Lagoons, *Sulfur bacteria, *Pigments, Oxidation lagoons, Farm wastes, Aerobic conditions, Anaerobic digestion, Anaerobic bacteria, Waste water treatment.
Identifiers: Red pigmentation, Thiorhodaceae.

Widespread investigations demonstrate that various genera of photosynthetic sulfur bacteria of the family Thiorhodaceae are usually responsible for red pigmentation in anaerobic easte stabilization lagoons. A number of these genera display only slight differences in morphology. Further taxonomic study may reveal that such differences represent nothing more than environmental reactions of a single genus. From observations and experience relating to the photosynthetic sulfur bacteria, the authors concur with other investigators on the possible practical role of these organisms in anaerobic waste lagoons. If the organisms are not naturally present in the lagoon, it has been recommended that they be introduced into it by massive inoculation. Their practical value lies in their potential ability to destroy reduced sulfur compounds and eliminate or reduce offensive odors. (Parker-Iowa State)
W72-00992

CAN LIME AND CHLORINE SUPPRESS ODORS IN LIQUID HOG MANURE,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
C. W. Hammond, D. L. Day, and E. L. Hansen.
Agricultural Engineering, Vol 49, No 6, p 340-343, June 1968. 4 fig, 8 tab.

Descriptors: *Lagoons, *Anaerobic bacteria, *Chlorination, *Hydrated lime, Sand filters, Mositure content, Biochemical oxidation demand, Chemical oxidation demand, Swine, Air circulation, Organic waste, Evaporation, Hydrogen ion concentration, Odor.
Identifiers: *Hog confinement building, Slatted floors, Experimental farm, Liquid hog manure.

Liquid manure collected in pits beneath self-cleaning slatted floors supports anaerobic bacteria that produce objectionable gases and odors in the hog confinement building. Studies were instituted to check the use of lime and chlorine for preventing the production of these odors. The studies indicated that hydrated lime reduced the production of hydrogen sulfide, but to a lesser extent than the chlorine. It did not prevent the liberation of ammonia. The hydrated lime required to maintain the desired pH would cost $0.62 per hog for 6 months at $2.20 per 100 lb. Chlorine treatment is an effective deterrent of ammonia, hydrogen sulfide, methane and carbon dioxide. The cost of adding enough chlorine to fill the chlorine demand is about $6.40 per hog for 6 months, based on a cost of $0.54 per gal. for the sodium hypochlorite. Chlorine and lime were also effective in controlling maggots and rodents in the building. Chlorine seemed most effective. Sand-bed filtering was also found effective in trapping solids and organic matter. Fewer than 5 per cent of the solids penetrated the sand to any significant depth, the largest portion being left on surface. (Brundy-Iowa State)
W72-00993

SECTION 169: AMORTIZATION OF POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 06C.
W72-01013

ZIMPRO WET OXIDATION OF SODA PULPING LIQUORS,
Zimpro Inc., Rothschild, Wis.
G. H. Teletzke, and L. A. Pradt.
Proceedings, Industrial Waste Conference, 24th, May 6,7, and 8, 1969, p 1195-1200, 5 fig, 4 ref.

Descriptors: *Waste water treatment, Pulp wastes, Chemical oxygen demand, Laboratory tests, Pilot plant, Air pollution, Automatic control, Explosions.
Identifiers: *Soda pulping process, Black liquor, Chemical recovery, Waste heat recovery, Thermal efficiency.

Associated Pulp and Paper Mills, Ltd, is an Australian pulp and paper company with its principle manufacturing facilities in Burnie, Tasmania. The company uses the straight soda process for pulping the native eucalyptus. The original soda recovery system was old, and inefficient. After several years of study, the Zimpro Wet Oxidation Process was selected for soda recovery. Laboratory studies and pilot plant studies resulted in a small unit to process black liquor corresponding to 30 pulp tons per day. This unit was constructed and placed on line in 1966. Results to date indicate a high chemical recovery, no air pollution problems, thermal efficiency up to 85% and no explosion hazards. The plant provides a pleasing appearance and pleasant working conditions. The operation can be completely automated but the savings would be relatively small. A larger unit is now in the design stage and it is hoped that this plant will be on line in 1971. Capital costs are higher than for conventional smelter-furnaces but the better operating efficiencies offset this. It is expected that the Wet Oxidation Process will allow some improvements in the soda pulping process to be developed. (Goessling-Texas)
W72-01027

RULES AND REGULATIONS GOVERNING THE OPERATION OF WATER POLLUTION CONTROL FACILITIES.
Oklahoma State Dept. of Health, Oklahoma City.
For primary bibliographic entry see Field 05G.
W72-01063

5E. Ultimate Disposal of Wastes

A CHALLENGE FOR THE PRESIDENT,
For primary bibliographic entry see Field 06E.
W72-00707

THE DISPOSAL OF AGRICULTURAL WASTE,
For primary bibliographic entry see Field 05B.
W72-00843

A COMPREHENSIVE ENVIRONMENTAL APPROACH TO MARINE WASTE DISPOSAL PLANNING,
Brown and Caldwell, San Francisco, Calif.
Dan P. Norris, Lawrence E. Birke, Robert T. Cockburn, and Denny S. Parker.
Preprint presented at Water Pollution Control Federation Conference, 44th, San Francisco, Calif, Session 12, No 2, October 5, 1971. 26 p, 12 fig, 4 tab, 11 ref.

Descriptors: *Water quality control, *Oceans, *Storm runoff, Outlets, Waste dilution, Advection, Design criteria, Flotation, Separation techniques, Chlorination, Environmental effects, Toxicity, Bioassays, Analytical techniques, Waste water treatment, *Waste disposal, California, Effluents.
Identifiers: *Combined sewer overflows, *Dissipation, *San Francisco (Calif).

A two-phase comprehensive study of the marine environment was conducted by the City of San Francisco to determine where and in what quantities it is feasible to dispose of the city's dry and wet weather effluents. The oceanographic phase of the study involved data collection on drift, dispersion, tidal flow, and other basic physical characteristics of potential discharge sites. Data was gathered both from surface and air borne vessels. Movement of surface flotables was determined by release and collection of cardboard floats, but results were verified later by spread of oil from a tanker collision. The ecological phase then provided basic data as to what will happen to the marine organisms exposed to the waste discharges. This phase included on-site diving studies, intertidal studies, and in situ bioassays, as well as controlled laboratory experiments. Final ecological design criteria can be met while discharging the total wet and dry weather flows to the Gulf of the Farallones at specific points. Primary treatment plus disinfection for dry weather flows and substantially complete removal of flotables for wet weather flows will be adequate treatment. A surface effluent field will allow transport and dissipation of the field seaward in the least possible time, making it environmentally preferable. (Lowry-Texas)
W72-00902

PHILADELPHIA'S OCEAN SLUDGE DISPOSAL EXPERIENCE AND STUDIES,
Philadelphia Water Dept., Pa.
Samuel S. Baxter, Carmen F. Guarino, Robert A. Erb, and Charles T. Davey.
Preprint of Paper Presented at Water Pollution Control Federation Conference, 44th, Session 12, No 5, October 5, 1971. 13 p, 4 fig, 1 tab, 4 ref.

Descriptors: *Sludge disposal, *Oceans, *Waste assimilative capacity, *Waste disposal, Waste dilution, Sampling, Monitoring, Water quality control, Dissolved oxygen, Coliforms, Odor, Heavy metals, Bioassay, Fish, Waste water treatment, Pennsylvania.
Identifiers: Sediment samples, *Philadelphia, Barging.

A Food and Drug Administration ban on shell fishing in an area surrounding the Philadelphia disposal site and a strong demand by citizens groups prompted the City to spend $75,000 to $100,000 to obtain scientific data on the disposal site and adjacent areas. The investigation is at the half-way point with significant results. Sediment samples taken from the center of the disposal area consisted of clean sand, gravel, and shell fragments. No black sludge or H2S emitting samples were found in or near the disposal site. At the disposal area's center, starfish, sand dollars, hermit crabs, and snails were found in good health, while fish specimens collected included winter flounder, mackeral, stargazer, long horned sculpin, and spiny dogfish. Dissolved oxygen levels in all bottom, middle, and surface waters within and surrounding the site showed no signs of oxygen depletion or sag. Coliform levels in all areas were zero, and there were no indications of significant heavy metal concentrations in surf clams or other macrofauna collected from the area. These data demonstrated that 10 years of sludge dumping has had no detectable adverse environmental effect. Each situation, however, must be evaluated as to its own particular conditions. (Lowry-Texas)
W72-00915

RESULTS OF A DEMONSTRATION AND OTHER STUDIES OF THE DISPOSAL OF HIGH LEVEL SOLIDIFIED RADIOACTIVE WASTES IN A SALT MINE,
Oak Ridge National Lab., Tenn. Health Physics Div.
F. M. Empson, R. L. Bradshaw, W. C. McClain, and B. L. Houser.
Health Physics, 1970. Vol 18, p 63-67, 1 fig, 17 ref.

Descriptors: *Waste disposal, *Radioactive wastes, *Mining, *Waste dumps, Salt, Gamma rays, Thermal stress, Cooling, Storage, Transportation, Rock mechanisms, Rock bolts, Technical feasibility, Economic feasibility, Cost analysis.

A 19 month study has demonstrated that burial in salt mines is one of the better methods for ultimate disposal of high-level solidified radioactive wastes. Average dose to the salt in the mine over the length of the radioactive container holes was approximately 8 x 10 to the 8th power rads, with a peak dose at 10 to the 9th power rads. Problems encountered in creep and plastic flow alterations due to elevated temperatures were easily solved. Basic stability of the salt under the effects of heat and radiation was demonstrated. It was also determined by both theoretical and experimental results that rock salt is approximately equivalent to concrete as an absorber of gamma radiation. Therefore, approximately 5 ft of solid salt or 7 1/2 ft of crushed salt (assuming 1/3 void) will give adequate biological protection to allow unlimited access to a room in a salt mine filled with the most radioactive waste of the future. The calculated cost per kilowatt-hour of electricity generated ranged from about 2 x .01 to 2 x .001 mill for wastes aged 1 year to 30 years respectively. A study of the economics of salt mine disposal indicated the method to be compatible with competitive nuclear power. (Lowry-Texas)
W72-00930

BASIC POINTS TO CONSIDER IN MANURE DISPOSAL PROBLEMS,
For primary bibliographic entry see Field 05D.
W72-00989

EFFLUENT DISPOSAL,
Lactose Co. of New Zealand Ltd., Kapuni.
J. M. Wood.
New Zealand Journal of Dairy Technology, Vol 4, No 4, December 1969, p 238-242.

Descriptors: *Dairy industry, *Waste disposal, *Water pollution sources, Legislation, Administration, Organic wastes, Biochemical oxygen demand, Milk, Oxidation, Water pollution control, Water pollution, Water temperature, Dissolved oxygen.
Identifiers: *New Zealand, Water Pollution Act, Effluent, Disposal.

An increasing concern in the preservation of natural water resources, and their protection from pollution is appearing in New Zealand even though the problem has not reached serious proportions there. This author has reviewed the New Zealand legislation with respect to this problem, especially the Water and Soil Conservation Act of 1967. He also reviews some aspects of river pollution and its causes and effects. He finishes with a brief discussion of some effluent treatment and disposal methods, with particular reference to the dairy industry. (Parker-Iowa State)
W72-00990

OCEAN DUMPING,
House of Representatives, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-01112

5F. Water Treatment and Quality Alteration

CHEMISTRY OF NATURAL WATERS -- IV. SATURATION PH VALUE,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
For primary bibliographic entry see Field 02K.
W72-00576

REGIONAL WATER AND SEWER NEEDS STUDY.
Southeastern Illinois Regional Planning and Development Commission, Harrisburg, Pa.
For primary bibliographic entry see Field 05D.
W72-00643

WATER FACILITIES.
Elam and Popoff, Glen Rock, N.J.

Available from the National Technical Information Service as PB-200 561, $3.00 in paper copy, $0.95 in microfiche. County Planning Board, County of Bergen, Hackensack, New Jersey, Final rept June 1970. 35 p, 3 fig, 2 tab. HUD P-125.

Descriptors: *Planning, *Water supply, *Water resources development, *Water distribution (Applied), Urbanization, Community development, Regional analysis, Capital costs, Water demand, Administration, Financing, Treatment facilities, New Jersey.
Identifiers: Bergen County (NJ), Comprehensive plan.

Water facilities and problems in Bergen county were analyzed to determine the needs and to develop comprehensive general plans for all of the people in Bergen County and its seventy municipalities. There are presently seventeen public water distribution systems in Bergen County, sixteen of which are owned by municipal water departments and the seventeenth by the Hackensack Water Company. Approximately 98 percent of the County's population is served by these systems, which had a total average daily water consumption of over 100 MGD in 1969. Residents in the unserved areas are dependent upon individual wells for their water. The report includes design criteria, and analyzes the adequacy of each water system in the County for meeting projected water demands. A regional solution is proposed for the municipalities in the northwest section of the County by creating a Northwest Service Area. Methods suggested for administering the proposed facilities and the availability of financial aid are discussed. Estimated construction and operating costs are presented. A long range solution to water supply problems is presented as a guide for County officials. (Poertner)
W72-00644

ANALYSIS OF COMPREHENSIVE WATER SUPPLY AND SEWAGE DISPOSAL STUDIES.
Ulster County Planning Board, Kingston, New York.
For primary bibliographic entry see Field 05D.
W72-00646

WATER AND SEWER SERVICE AREAS.
Central Connecticut Regional Planning Agency, New Britain.
For primary bibliographic entry see Field 05D.
W72-00647

GENERAL PLAN FOR WATER AND WASTEWATER SYSTEMS.
Chino Basin Municipal Water District, San Bernardino, Calif.
For primary bibliographic entry see Field 05D.
W72-00648

HYGIENIC ASSESSMENT OF THE TRACE ELEMENTS COMPOSITION OF DRINKING WATER, OBTAINED BY PARTIAL DESALINATION METHODS, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W72-00650

SUBSTANTIATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF TH232 AND OF NATURAL THORIUM IN DRINKING WATER, (IN RUSSIAN),
Institut Gigieny Truda i Professionalnykh Zabolevanii, Moscow.
For primary bibliographic entry see Field 05C.
W72-00656

WIDE VARIATIONS OF FLUORIDE SUPPLY TO INFANTS AND THEIR EFFECT,
Karolinska Institutet, Stockholm (Sweden). Dept. of Cariology.
Y. Ericsson, and Ulla Ribelius.
Caries Res. 5 (1): 78-88. Illus. 1971.
Identifiers: Fluoride, Infants, Variations.

Infant feeding with water-diluted cow's milk or, still more, dry-milk formulas supplies many times greater fluoride doses than breast-feeding, already with low water fluoride content. An investigation of 260 school children in Uppsala (1.2 ppm F in the drinking water) showed only an insignificant trend towards increased enamel mottling in typically formula-fed children, compared to breast-fed children. Among 25 children in the small community Billesholm (5.5 ppm F in the drinking water) the same trend was only slightly stronger. No difference in caries rate was found between breast-fed and bottle-fed children in any of these communities. No health hazard seems to be involved in any of these fluoride doses, but the need to consider all the factors that can be changed when introducing new nutritional and therapeutic methods is pointed out.--Copyright 1971, Biological Abstracts, Inc.
W72-00696

FIELD TECHNIQUES FOR REMOVING NITRATES FROM DRAINAGE WATER,
Bureau of Reclamation, Fresno, Calif. Westlands Water District.
John W. Williford, John A. McKeag, and William R. Johnston.
Transactions of the American Society of Agricultural Engineers, p 167-171, 1971. 5 fig, 4 tab, 7 ref.

Descriptors: *Irrigation water, *Drainage water, *Nitrates, Agriculture, Denitrification, Costs, Water purification, Separation techniques, California.
Identifiers: San Luis Drain (Calif), San Luis Wasteway (Calif), Deep trench technique, Barley straw cover, Water grass plots.

A 3.3 day detention of drainage water in a deep trench filled with barley straw reduced nitrate concentration of agricultural drainage water from 35 to less than 2 ppm. A 2 day detention of drainage water ina a shallow grass plot reduced nitrate content from 70 to less than 10 ppm. The cost of treatments per acre-foot of drainage water containing 70 ppm of nitrate was estimated between $1.50 and $1.90. (Wilde-Wisconsin)
W72-00840

MODELING A RIVER.
Purdue Univ., Lafayette, Ind. School of Engineering.
For primary bibliographic entry see Field 06A.
W72-00854

HIGH-ENERGY RADIATION SYNTHESIS OF OZONE FOR WATER TREATMENT,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 05D.
W72-00867

MODERN CONCEPT OF DISINFECTION,
Public Health Service, Cincinnati, Ohio. Bureau of Water Hygiene.
Shih L. Chang.
Journal of the Sanitary Engineering Division, ASCE, Vol 97, No SA 5, October 1971. p 689-707, 2 tab, 87 ref.

Descriptors: *Disinfection, *Viricides, *Bactericides, Mathematical studies, Statistical methods, Systems analysis, Bacteria, Virus, Data collection, Microorganisms, Coliforms, Proteins, Chlorination, Waste water treatment, *Water treatment.
Identifiers: *Destruction rate constant, *Cysts, Gaseous agents, Chemical agents, Physical agents.

Disinfectants were grouped into 6 categories: (1) oxidizing agents; (2) cations of heavy metals; (3) and (4) quaternary ammonium and pyridinium compounds; (5) gaseous agents; and (6) physical agents. Microorganisms were classified as amoebic cysts, bacteria, or viruses, with the spores omitted. Disinfection literature was critically reviewed, and the quantitative data analyzed in an effort to develop a modern disinfection concept, the chemistry of disinfectants, the cyto-structure and physical state of microorganism, their reaction as a rate process, and the interference of chemical and physical factors in the reaction medium. Systematization of disinfection design and operation data was suggested, requiring the setting of a standard destruction rate and giving the various constants and other quantitative parameters for each disinfectant as a chemical species. (Lowry-Texas)
W72-00908

5G. Water Quality Control

CRAWFORD V YEATTS (SALINE POLLUTION OF FARMLAND FROM OIL DRILLING).
For primary bibliographic entry see Field 06E.
W72-00572

TRILLINGHAM V. ALASKA HOUSING AUTHORITY (POLLUTION OF PERCOLATING WATERS).
For primary bibliographic entry see Field 06E.
W72-00575

LANDERS V. EAST TEXAS SALT WATER DISPOSAL CO. (JOINDER OF POLLUTERS AS DEFENDANTS).
For primary bibliographic entry see Field 06E.
W72-00585

LANDERS V. EAST TEXAS SALT WATER DISPOSAL CO. (ESCAPE OF OIL AND SALT-WATER INTO LAKE).
For primary bibliographic entry see Field 06E.
W72-00658

RATZLAFF V. FRANZ FOODS OF ARKANSAS (VIOLATION OF CONTRACT NOT TO OVER-SATURATE CITY SEWER SYSTEM),
For primary bibliographic entry see Field 06E.
W72-00661

STATE V. DAIRYLAND POWER COOP (POWER OF ATTORNEY GENERAL TO ABATE PUBLIC NUISANCE IN OPERATION OF POWER PLANT).
For primary bibliographic entry see Field 06E.
W72-00662

CHILLISQUAQUE CREEK WATERSHED ASS'N V. SANITARY WATER BD. (ADMINISTRATIVE DISCRETION IN GRANTING PERMITS FOR WASTE DISCHARGES).
For primary bibliographic entry see Field 06E.
W72-00704

A CHALLENGE FOR THE PRESIDENT,
For primary bibliographic entry see Field 06E.
W72-00707

THE ROLE OF MICROORGANISMS GROWING ON OIL IN THE SELF-CLEANING AND INDICATION OF OIL POLLUTION IN THE SEA, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
O. G. Mironov.
Okeanologiya. 10 (5): 820-827. Illus. Map. 1970. English summary.
Identifiers: Bacteria, Cleaning, Growing, Microorganisms, Oil, Pollution, Sea, Self.

The microorganisms isolated from the water of the Black Sea and Indian Ocean can be grown on oil and oil products using them as the only source of C and energy. This suggests a possible oxidation of oil products that find themselves in the sea. However, the overwhelming majority of hydrocarbon oxidizing microorganisms show their ability to grow not only on hydrocarbons but also on other carbon sources, for instance, on peptones. Therefore when hydrocarbon and non-hydrocarbon sources of C, in particular oil and sewage are in the sea simultaneously, the self-cleaning of the sea area from organic components of the sewage will be more rapid than the rate of oil decay in the sea water. A close relation between the presence in the sea of hydrocarbon oxidizing microorganisms and oil pollution of the sea water gives every reason to regard this group of bacteria as an oil pollution indicator.--Copyright 1971, Biological Abstracts, Inc.
W72-00709

ERADICATING CERATOMYXA SHASTA FROM INFECTED WATER BY CHLORINATION AND ULTRAVIOLET IRRADIATION,
California State Dept. of Fish and Game, Sacramento.
Gerald W. Bedell.
Progr Fish-Cult. 33 (1): 51-54. Illus. 1971.
Identifiers: Ceratomyxa-Shasta, Chlorination, Elimination, Eradicating, Infected, Irradiation, Parasite, Trout, UV.

Although neither UV irradiation nor chlorination completely prevented occurrence of C. shasta among rainbow trout, test results were encouraging. Indications were that either method could completely eliminate Ceratomyxa from infected water.--Copyright 1971, Biological Abstracts, Inc.
W72-00739

RYAN V. PITKIN IRON CO. (VALIDITY OF PERMIT TO BUILD CAMPSITE AND SEWAGE DISPOSAL PLANT ON NATIONAL FOREST LANDS).
For primary bibliographic entry see Field 06E.
W72-00740

GUTHRIE V. ALABAMA BY-PRODUCTS CO. (FEDERAL QUESTION JURISDICTION UNDER THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W72-00749

WATER SUPPLY AND SEWAGE FACILITIES PLAN, UPDATE-1970, LEHIGH AND NORTHAMPTON COUNTIES, PENNSYLVANIA.
Lehig-Northampton Counties Joint Planning Commission, Lehig Valley, Pa.

Available from the National Technical Information Service as PB-198 586, $3.00 in paper copy, $0.95 in microfiche. Project report, January, 1971. 118 p. HUD-PA-290.
Identifiers: *Regional planning, *Sewers regional planning, Populations, Projection, *Lehig County, Pennsylvania, *Northampton County, Pennsylvania.

The 1970 Update of the Joint Planning Commission's 1966 Water and Sewer Plan includes several items. These are: a thorough inventory of sewer and water installations that have been made since completion of the original Water and Sewer Plan; a re-evaluation of the criteria used in the first plan to determine their applicability of the real problems in implementing the regional plan over the past four years; and the establishment of a priority program for future water and sewer facilities.
W72-00750

THE ECOLOGICAL CRISIS--MAN'S ULTIMATE CHALLENGE,
For primary bibliographic entry see Field 06E.
W72-00751

WATER POLLUTION,
Senate, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00790

INTRODUCTION OF A BILL TO ESTABLISH AN ENVIRONMENTAL QUALITY ADMINISTRATION,
For primary bibliographic entry see Field 06E.
W72-00793

REVISED OBJECTIVES FOR DESIGN OF URBAN STORMWATER SYSTEMS IN THE PUGET SOUND REGION,
Washington Univ., Seattle. Inst. of Forest Resources.
David D. Wooldridge.

Available from the National Technical Information Service as PB-204 229, $3.00 in paper copy, $0.95 in microfiche. Completion Report, September, 1971. 27 p, 2 fig, 7 tab, 15 ref. OWRR B-035-WASH (1).

Descriptors: *Storm runoff, *Storm drains, *Drainage, Drains, Subsurface runoff, Runoff, Sewage, Waste water, Ecology, Design, Planning, *Urbanization, Cities, Washington, Infiltration, Soils, *Ecosystems, Costs, Attitudes.
Identifiers: *Urban drainage, *Seattle (Wash), Storm water, *Puget Sound region.

Objectives of current designs for urban storm runoff systems specify: (1) draining all surface water (for 25 year rain storms) from the entire design area, and (2) removing this water with less than 15 minutes of surface travel time. These objectives require an average investment of 7,600 dollars per acre in conduit systems. The current rate of population growth suggests a rate of urbanization of 5,000 to 6,700 acres per year or a cost for urban storm runoff systems of 40 million dollars per year. To date the electorate on two occasions has refused funds necessary to provide such systems. Reluctance of a majority of the populace to commit needed financial support coupled with concern for the impacts of such systems on urban environmental quality deemed examination of the above objectives necessary. This examination has been made including review of effects of urbanization on physical hydrology and the hydrologic cycle. Above objectives are indeed incompatible with current goals of urban environmental quality and maintenance of standards of stream ecology. If current goals of urban environmental quality are accepted, this revised objective for storm runoff removal must also be accepted: Storm runoff from any given area may not be altered in timing or delivered at rates exceeding the current or natural rate. Investigation of methods of achieving this objective is continuing.
W72-00797

PLANKTON ASSOCIATIONS AND RELATED FACTORS IN A HYPEREUTROPHIC LAKE,
Washington Univ., Seattle. Water and Air Resources Div.
For primary bibliographic entry see Field 05C.
W72-00798

DILUTION AS A CONTROL FOR NUISANCE ALGAL BLOOMS,
Washington Univ., Seattle. Water and Air Resources Div.
Eugene B. Welch, James A. Buckley, and Ronald M. Bush.
Partial Project Completion Report, August 31, 1971. 39 p, 14 fig, 8 tab, 18 ref. OWRR A-034-WASH (2).

Descriptors: *Waste dilution, Water pollution control, *Nuisance algae, *Eutrophication, Lakes, Washington, *Algal control, Nutrients, Biomass, *Cyanophyta, Plant growth, Plankton.
Identifiers: *Moses Lake (Wash), Hypereutrophic lakes.

Experiments were conducted in situ in hypereutrophic Moses Lake in eastern Washington to determine the effect of low-nutrient dilution water on growth and dominance of nuisance blue-green algae, the mechanism of effect and suggest possible control measures by comparison with results from a successful control program in Green Lake in Seattle. The addition of low-nutrient Columbia River water to Moses Lake water reduces the subsequent maximum biomass of nuisance blue-green algae attained in the dilution water-lake water mixture in direct proportion to the amount of dilution water added. In contrast to biomass, the relationship between dilution water addition and maximum growth rate of blue-green algae is non-linear. Growth rate remained high (two doublings per day) and relatively constant at lake water concentrations down to about 50% and then dropped rapidly to negative rates at 0% lake water. Comparison of results of dilution water addition to Green Lake in Seattle with experimental and calculated potential effects of dilution water in Parker Horn of Moses Lake allowed estimates of dilution rates that might offer some control of blue-green algae blooms. Addition of low-nutrient river water at about 1% per day would be expected to result in a lake water--river water mixture that would reduce maximum growth rate by one half in about 150 days and reach a steady state biomass in about 200 days. (See also W72-00798)
W72-00799

A BILL TO PROVIDE A NATIONAL COMMITMENT FOR FINANCING OF EXPANDED PROGRAMS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT,
Senate, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00804

FEDERAL WATER POLLUTION CONTROL ACT,
House of Representatives, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00811

INTRODUCTION OF CLEAN LAKES ACT OF 1970,
Senate, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00831

SIX BILLS TO IMPLEMENT THE PRESIDENT'S ENVIRONMENTAL PROGRAM,
House of Representatives, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00832

DETERGENT POLLUTION CONTROL ACT OF 1970,
House of Representatives, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00839

MANAGING OUR ENVIRONMENT.
Agricultural Research Service, Washington, D. C.

Dept of Agriculture, Washington D C, Agriculture Information Bulletin No 351, April 1971. 48 p.

Descriptors: *Management, *Environment, *Agriculture, *Water pollution control, Sediments, Farm wastes, Nutrients, Phosphorus, Algae, Nitrates, Water reuse, Salinity, Pesticides, Livestock, Waste disposal, Oxidation lagoons, Dehydration, Runoff, Radioactivity, Fallout, Biocontrol, Insect control, Irrigation, Predation, Parasitism, Insect resistance, Insect attractants, Precipitation (Atmospheric), Genetics, Erosion control, Air pollution, Trees.
Identifiers: Feedlots, Composting, Plant residues, Recycling food, Processing wastes, Pathogens, Bioenvironmental controls.

Some of the major problems in agricultural research dealing with new and older methods of environmental management are described in an effort toward interesting the public in preservation of the quality of our environment. General material is presented under the subjects 'Protecting land, water and waterways,' 'Management of farm wastes,' 'Recycling food processing wastes,' 'New ways to fight pests--alternatives to pesticides,' and 'A green world--a clean world.' Among the problems discussed are prevention of animal wastes reaching waters, phosphorus from human wastes and detergents, multiple water reuse, and salinity in irrigated lands of the Southwest. Scientists are trying to prevent pesticide residues in soil and water and avoid pesticide overuse. Fallout from nuclear weapon testing calls for various decontamination

treatments; food processing waste disposal and recycling is described, and recovery of potable water from seawater by reverse osmosis. Alternatives to pesticides are destruction of insects and weeds by introduction of predators, parasites, and pathogens which feed on or infect pests; resistant varieties, attractants, genetic control, bioenvironmental controls, and hormone and daylight manipulation. (Jones-Wisconsin)
W72-00846

LABORATORY TESTS FOR PLANT OPERATION CONTROL AND STREAM QUALITY MEASUREMENT,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W72-00849

MODELS FOR MULTICOMPONENT MICROBIAL ECOSYSTEMS,
Clemson Univ., S.C. Div. of Interdisciplinary Studies.
H. R. Bungay, and M. J. B. Paynter.
Preprint, American Institute of Chemical Engineer National Meetings, Cincinnati, Ohio. OWRR A-016-SC (3).

Descriptors: *Simulation analysis, *Computer models, *Mathematical models, *Aquatic microbiology, *Input-output analysis, Biological communities, Predation, Ecology.
Identifiers: *Lotka-Volterra, *Monad equations.

Future improvements in fields such as biological waste treatment, stream purification, ruminant nutrition, food and soil microbiology and industrial fermentations depend on a greater understanding of microbial ecology. Numerous variables and obscure interrelationships make data interpretation very difficult. This paper combined known organisms in continuous culture in order to characterize the features of general classes of associations. Promising aspects of ecosystems for exploration and rapid screening of various permutations of parameters were accomplished by computer simulation. Models of two-member interactions and simulation of three and four-member systems provided insight into the behavior of more complex ecosystems. Predation was researched extensively. Some systems based on predation and simple competition in continuous culture were described in detail. Simulations were performed in CSMP for the IBM 360 computer. Simulation permitted exact definition of the system by means of the assumptions used in constructing the model and laboratory research provided meaningful data from which coefficients and characteristics could be derived. The computer approach allows rapid testing of ideas, and, together with laboratory research, is providing a foundation for ecological analysis. (Markell-Cornell)
W72-00855

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING ALGORITHM TO POLLUTION CONTROL,
Purdue Univ., Lafayette, Ind.
G. Graves, D. Pingry, and A. Whinston.
Research Report, August 1971. 54 p, 5 fig, 5 tab, 14 ref. OWRR B-020-IND (3).

Descriptors: *Simulation analysis, *Mathematical models, *Pollution abatement, *Dissolved oxygen level, *River systems, *Water quality control, Treatment facilities, Estimating, Flow rates.
Identifiers: *Streeter-Phelps, *West Fork White River.

This six part report presented a large scale monlinear mathematical model whose objective function was to minimize the total cost of pollution abatement structures subject to water quality (level of dissolved oxygen) in each section of river better than some given set of quality goals. Unlike most programming models, it was assumed that the level of effluent flow affects the reaeration rate and flow velocity. Therefore, the effect of flow on the reaeration coefficient would be significant and the quality constraints nonlinear. A river simulation model considered the following treatment alternatives: flow augmentation, treatment plants (regional and at polluter) and bypass piping. The simulation model also used nonlinear equations. By means of the objective function, a nonlinear programming model provided a decision-making criteria to select least-cost treatment abatement program for a given set of quality goals. To solve the programming problem, a stepwise algorithm method with 16 subroutines was used. DOCAL was the computer program used. Finally, the model was applied to the West Fork White River in Indiana with some modifications. (Markell-Cornell)
W72-00856

PLANNING FOR POLLUTION CONTROL - A CRITICAL SURVEY,
Purdue Univ., Lafayette, Ind.
D. Pingry, and A. Whinston.
August 1971. 30 p, 1 fig, 34 ref. 14-31-001-3080. OWRR B-020-IND (4).

Descriptors: *Optimum development plans, *Mathematical models, *Linear programming, *Simulation analysis, *Resource allocation, *River basin, Pollution abatement, Estimating, Cost-benefit analysis, Water quality control.
Identifiers: *Streeter-Phelps.

A survey of mathematical models of a river basin was presented which examined the cost and river water quality resulting from alternative approaches to water pollution control. The applicability of the models was analyzed. Specifically, the following topics were studied: (1) the general structure of the planning models; (2) the explicit formulation of existing basin planning models; (3) the limitations of the current basin models; and (4) priorities for future research. The general structure of the models took the form of a constrained optimization problem. Steady state variables included effluent, tributary and groundwater flows and the quality parameters of these flows. Control variables were those subject to alteration by the basin authority. Important water quality parameters were dissolved oxygen level and water temperature. Linear constraints and functions were used, thus most models reviewed used linear programming as a solution technique. Technical (inadequate data base), economic (difficulty of estimating cost functions) and social-political problems (lack of public or private organizations with authority to implement a basin solution) were found to limit implementation of the current basin models. It was concluded, however, that a primary objective of future research would be the collection and organization of a data base. (Markell-Cornell)
W72-00857

A WATER QUALITY PREDICTION MODEL AND A WATER QUALITY SIMULATION PROGRAM FOR THE WABASH RIVER,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05B.
W72-00860

FINANCING MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS,
Department of Health, Education, and Welfare, Cincinnati, Ohio. Bureau of Solid Waste Management.
For primary bibliographic entry see Field 06C.
W72-00864

ENVIRONMENT IN DANGER OF COLLAPSE,
House of Representatives, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-00865

AN INVESTIGATION OF ALTERNATE WASTE MANAGEMENT POLICIES IN A RIVER BASIN,
Clemson Univ., S.C.
Guy E. Slagle, Jr.
Master's Thesis Dec. 1970. 105 p, 26 fig, 36 tab, 37 ref. OWRR B-017-SC (5).

Descriptors: *Regions, *Water quality control, *Cost-benefit analysis, *Waste water treatment, Regional analysis, Economies-of-scale, Transportation, Cost sharing, Watersheds (Basins), Legislation, Water policy, Outlets.

Most previous regional wastewater treatment schemes have included only wastewater treatment at the source. To broaden the decision base, several straight forward basin waste treatment policies were considered for a simple hypothetical river basin, including: (1) 'Bad neighbor' policy; (2) Equal percent policy; (3) One facility-one outfall; (4) one facility-three outfalls discharging equal waste quantities; and, (5) one facility-three outfalls discharging different waste quantities. By examining the hypothetical situation, it is readily apparent that each individual region or basin must be studied separately in order to arrive at a least cost-greatest benefit solution. The cost of a basin policy was shown to be a function of several factors, including the water quality standard, quantity of waste generated; distance between waste sources, and stream conditions. Each of the policies studied were capable of being the least cost solution under certain conditions, and in many cases, more than one of the policies would be of approximately the same least cost. Therefore, the function of a regional authority was demonstrated to be one of investigation, study, and recommendation of policy, as well as implementation of the policy chosen. (Lowry-Texas)
W72-00913

MASS CULTURING OF ALGAE IN CONTROLLED LIGHT-DARK DETENTION SYSTEMS: I. EFFECTS OF CULTURE DENSITY,
Norwich Univ., Northfield, Vt. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W72-00917

WATER QUALITY STANDARDS,
For primary bibliographic entry see Field 06E.
W72-00918

LEGISLATION TO AMEND THE REFUSE ACT FOR INDIVIDUAL CIVIL ACTS AGAINST WATER POLLUTERS,
United States House of Representatives.
For primary bibliographic entry see Field 06E.
W72-00919

WEYERHAEUSER'S TREATMENT OF PULP AND PAPER WASTES AT THE PLYMOUTH, NORTH CAROLINA COMPLEX,
Weyerhaeuser Co., Plymouth, N.C.
For primary bibliographic entry see Field 05D.
W72-00920

THE FOOD INDUSTRY'S INVOLVEMENT IN ENVIRONMENTAL CONCERNS,
National Canners Association, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-00929

THE EFFECT OF MAJOR INDUSTRIAL SPILLS UPON STREAM ORGANISMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. Center for Environmental Studies.
For primary bibliographic entry see Field 05C.
W72-00934

SYMPOSIUM ON ENGINEERING WITH NUCLEAR EXPLOSIVES.
American Nuclear Society, Washington, D.C.; and Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 08H.
W72-00966

WATER POLLUTION,
For primary bibliographic entry see Field 06E.
W72-00973

WATERS--APPLICATION OF PESTICIDES.

Public Laws of Maine, 1971, ch 377, secs, 1454A, 1455, 1458, Maine Legislative Service, p 445-446.

Descriptors: *Maine, *Pesticides, *Application methods, *Permits, Pest control, Adoption of practices, Control, Inspection, Standards, Regulation, Legal aspects, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Legislation, Administrative agencies.

Applying pesticides to or in any river, stream, pond, or tributary is prohibited without a permit from the State Board of Pesticides Control. Applications for permits must be submitted in proper form at least thirty days prior to the date for application of the pesticides. If the Board finds that the proposed application of pesticides conforms with applicable laws and regulations and is unlikely to adversely affect any plant or animal life other than that sought to be controlled it may grant the permit. The Board may attach to the permit such reasonable terms and conditions such as: (1) reasonable periodic inspections, (2) maintenance of records and (3) furnishing of reports. Each day of operation without a permit constitutes a separate offense. (Gallagher-Florida)
W72-00995

TORT LIABILITY RESULTING FROM MINING OPERATIONS,
D. E. Schwinn.
Rocky Mountain Mineral Law Institute, Vol 8, p 461-507, 1963. 47 p, 245 ref.

Descriptors: *Mining, *Legal aspects, *Water pollution effects, *Damages, Risks, Soil mechanics, Land subsidence, Real property, Mineralogy, Excavation, Exploration, Explosives, Surface waters, Percolating water, Underground streams, Water rights, Prior appropriation, Structures, Statutes, Judicial decisions, Remedies, Streamflow, Water law.

Tort liability may arise from the pollution of or interference with streamflow. The pollution of surface and underground water by prescription or contract is examined. Measuring damages to percolating water from pollution under the American and English rules is explained. The removal of the landowner's subjacent and lateral support creates tort liability. Liability for damages to structures, the application of the statute of limitations, and the assessment of damages for permanent and reparable injury are discussed. For an innocent trespass, resulting from the wrongful exploration and removal of minerals, the general rule allows damages for the value of the 'mineral in place', thereby awarding the trespasser his profits. For a willful trespass the injured party is allowed the full value of the converted mineral. Blasting with high explosives may create tort liability in which the liability for the actual physical invasion of plaintiff's property is absolute under liability without fault. For damages caused by concussion or vibrations from the blast there may be either absolute liability or liability based upon negligence. Actions constituting negligence are discussed. (Rees-Florida)
W72-00996

MARINE PROTECTION RESEARCH AND SANCTUARIES ACT NEEDED,
House of Representatives, Washington, D. C.
For primary bibliographic entry see Field 06E.
W72-00997

ENVIRONMENTAL LAW ABSTRACTS, VOLUME 1,
A G C Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05G.
W72-00998

ENVIRONMENTAL LAW ABSTRACTS, VOLUME 1,
A G C Oak Ridge National Lab., Tenn.
J. W. Curlin, R. W. Deitchman, and G. V. Ulrikson.
Available from the National Technical Information Service as ORNL-NSF-2, $3.00 in paper copy, $0.95 in microfiche. February, 1971. 49 p.

Descriptors: *Environment, *Legal aspects, *Abstracts, *Information retrieval, Bibliographies, Technical writing, Technical societies, Libraries, Publications, Editing, Reviews, Data storage and retrieval, Data processing, Environmental effects, Water pollution, Air pollution, Natural resources, Environmental engineering, Federal government, Organizations, Judicial decisions, Legislation, Administrative agencies, Documentation.

The legal profession's main vehicle of information and discussion, the legal periodical, is generally not accessible to environmental scientists. The 'Environmental Law Abstracts' seeks to bridge the communication gap between scientist and lawyer. The first volume is a selected annotation incorporating a diversity of titles rather than an exhaustive treatment of one subcategory. Current and past environmental articles will be abstracted in subsequent volumes. The approach is to utilize several bibliographic sources including 'The index of Legal Periodicals'. Titles will be abstracted within the following subject areas: (1) air pollution, (2) environmental control, (3) forests and forestry, (4) marine resources, (5) natural resources, (6) public lands, (7) regional planning, (8) science, (9) territorial waters, (10) waters and watercourses, (11) zoning, (12) pollution, and (13) drainage. A key word thesaurus is subdivided as to: (1) recipients, (2) causal agents, (3) legal factors. It describes legal factors involved, while being compatible with existing scientific word lists. An example of the organizational format of an abstract is shown. A permuted word index and a key word index follow the abstracts contained in this issue. (Rees-Florida)
W72-00998

REMARKS BY U. K. ATTORNEY GENERAL ON 'TORREY CANYON' SETTLEMENT.
International Legal Materials, Vol 9, p 633-635, 1970. 3 p.

Descriptors: *Foreign countries, *Ships, *Oil, *Damages, *Disasters, Remedies, Legal aspects, International law, Law of the sea, Water pollution, Water pollution sources, Oily water, Compensation, Local governments, International commissions, Insurance, Oil industry, Non-structural alternatives.
Identifiers: *United Kingdom, *Oil spills.

In the House of Commons, the United Kingdom's Attorney General discussed the agreement reached between Britain, France, and the owners and time charterers of the Torrey Canyon. The agreement involved the settlement of claims made by the two governments for damages and expenses incurred when oil escaped from the stranded vessel. The vessel's owners agreed to pay three million pounds in full settlement of the claims. The British Government had already reimbursed local authorities for losses and expenses. Since private claimants would have faced formidable legal and practical difficulties in establishing claims in foreign courts, Britain and France attempted to protect the legal rights of these private persons. In addition to public claims, the owners agreed to offer a measure of compensation to private persons and firms, when their damage was not subject to insurance recovery or financial relief. A convention, to improve the rights and powers of coastal states in obtaining compensation, is being considered for losses arising from oil spillage. The Inter-Governmental Maritime Consultative Organization also called a meeting after the disaster. (Shelnut-Florida)
W72-00999

CLEAN WATER FOR FLORIDA'S ESTUARIES.

Summary, Florida Public Meeting, National Estuarine Pollution Study, Federal Water Pollution Control Administration, March 12-13, 1968. 22 p, 13 photo.

Descriptors: *Florida, *Water pollution control, *Estuaries, *Coasts, State governments, Federal government, Administrative agencies, Administrative dicisions, Planning, Technology, Industry, Industrial wastes, Commercial fishing, Recreation, Navigation, Education, Agriculture, Mosquitoes, Water quality, Water quality control, Water pollution, Water pollution sources, Water pollution effects.

The Clean Water Restoration Act of 1966 authorized the National Estuarine Pollution Study, directing the Department of the Interior to make a comprehensive study of pollution in coastal and estuarine areas and report to Congress. A public meeting was conducted in Orlando, Florida on March 12-13, pursuant to the study. This summary of the meeting contains position statements of both public and private interests concerning: (1) responsibility, as between state and federal governments, for pollution control in estuaries; (2) planning programs for pollution control; (3) research programs in pollution control; (4) the relation of industry to pollution control; (5) effects of pollution on commercial fishing; (6) recreation in estuaries; (7) the effect of pollution upon navigation; (8) education of the public for pollution control; and (9) the effect of agriculture and mosquito control on pollution in estuaries. (Hart-Florida)
W72-01000

THE DEVELOPMENT OF BASIC WATER RESOURCE LAWS AND POLICIES IN RHODE ISLAND.
Water Resources Board, Providence, R. I.

Comprehensive Water and Related Land Resources Planning, Task No. 15, Historical, Legal, and Institutional Environment of Water and Related Land Resources in Rhode Island. 97 p, 179 ref.

A compendium of the historical, legal, and legislative environment of Rhode Island's water resources is presented. Characteristics of the major alternative systems of water rights are summarized to demonstrate the evolution of prevailing water rights doctrines. Past assumptions of abundant clean water caused legal emphasis to be placed primarily upon the rights of riparian owners, limited only by reasonable use. Modern population and industrial growth has, however, created a massive pollution problem, inadequately solved by existing legal doctrines. Broader powers were therefore vested in public administrative agencies to combat water pollution. Riparian rights, however, remain the foundation of water law. The present state of the doctrine is analyzed. Other areas of concern are treated, including surface waters, groundwaters, and navigable waters. The status of the water pollution problem is described. Included is an outline of current legislation as well as a discussion of the dilemma from a judicial point of view. The problems of varying interests and rights to water cannot be solved solely by legislators and scientists. Decisions about water pollution will continue to be made in equity courts, balancing future needs with present limitations. (Smiljanich-Florida)
W72-01001

THERMAL DISCHARGES: A LEGAL PROBLEM,
W. A. Thomas.
Tennessee Law Review, Vol 38, No 3, p 369-390, Spring 1971. 22 p, 116 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water pollution control, *Legal aspects, Water pollution, Water pollution sources, Water pollution effects, Water quality, Water quality control, Hydroelectric plants, Agriculture, Legislation, Water Quality Act, Rivers and Harbors Act, Pollutants, Pollution abatement, Federal government, State governments, Administrative agencies, Administrative decisions, Permits.

The generation of electricity requires 80% of the water used for cooling purposes. Accordingly it is the center of the controversy over thermal discharges. Deleterious environmental effects result from thermal pollution because biological life is adapted to a very narrow temperature range. The physiological effect is an increased metabolic rate; increased susceptibility to predators may also occur. Moreover, warmer water holds less oxygen. At present the most advantageous use for waste heat is in aquaculture. At common law, both damages and injunctions have been secured for thermal pollution. American decisions have also prevented thermal pollution under tort theories of nuisance or riparian rights. Although nuclear powerplants cause much thermal pollution, the Atomic Energy Commission has no authority, under statutory interpretations, to consider thermal effects in granting licenses. Other remedies may be available under the Refuse Act, Water Quality Act, or the Water Quality Improvement Act. Administrative agencies, however, have little authority over plants causing thermal pollution. The federal attack on thermal pollution displays every indication of becoming successful. The courts will be called upon to resolve novel technological issues. (Hart-Florida)
W72-01002

ENVIRONMENTAL LAW--CONSIDERATION MUST BE GIVEN TO ECOLOGICAL MATTERS IN FEDERAL AGENCY DECISIONS--ZABEL V.
W. A. Goldstein.
Boston College Industrial and Commercial Law Review, Vol 12, No 4, p 674-685, March 1971. 12 p, 57 ref.

Descriptors: *Environmental effects, *Administrative decisions, *Permits, *Judicial decisions, Water pollution, Environment, Dredging, Landfills, Water policy, Administrative agencies, Administration, Federal government, Water resources development, Water pollution sources, Navigation, Rivers and Harbors Act, Submerged Lands Act, Wildlife conservation, Legal aspects, Legislation.

A recent environmental case is commented upon and analyzed. In the case, the Army Corps of Engineers was allowed to deny a dredge and fill permit for environmental reasons. This is the first judicial formulation of a principle sanctioning strict agency vigilance over the preservation of natural resources. It is suggested that the court's reliance on the Rivers and Harbors Act was misguided, as that Act only meant to apply to navigational hazards. Utilizing prior case law, however, the court expanded the discretionary power of the Corps in denying permits. The result was proper when various other environmental statutes are considered. The Corps may consider advice rendered by other agencies such as the Fish and Wildlife Service. The National Environmental Policy Act clearly directs all federal agencies to consider the environmental impact of agency action. In recognizing the right of the Corps to hear community sentiment, Zabel v. Tabb judicially manifested that the people possess a degree of self-control over their environment. The decision may privide the foundation for an ecosystems approach to the national land policy. (Smiljanich-Florida)
W72-01003

POLLUTION OF FRESH WATER.
In: The Development of Basic Water Resource Laws and Policies in Rhode Island, Water Resources Board, Providence, Rhode Island, p 64-96. 33 p, 67 ref.

Descriptors: *Rhode Island, *Water pollution control, *Riparian rights, *Remedies, Water pollution, Competing uses, Judicial decisions, Legislation, Regulation, Water rights, Reasonable use, Relative rights, Riparian land, Riparian waters, Waste disposal, Water resources, Water pollution sources, Legal aspects, Water quality control.

After tracing the historical development of water pollution problems in Rhode Island, the report evaluates the present problems facing the Water Resources Board in their effort to reduce to the lowest practical minimum the pollution of the state's water resources. No comprehensive plan of action, however, can be initiated to alleviate or improve these conditions until the legal aspects of pollution control in Rhode Island are clarified. A discussion is therefore made of the position taken by Rhode Island courts on such issues as: (1) the reasonable use rule; (2) the natural and artificial use distinction; and (3) public and private nuisance, including the remedy of self help. Analysis is then made of the case law approach to some of the common problems arising out of pollution by riparian owners, including: (1) interference with the uses of other riparians, (2) foreign particles washing onto the land of lower riparians, and (3) odor from pollutants. After evaluating the case law remedies for water pollution, the report considers the Water Pollution Act and other pollution control statutes in regard to possible constructions of the statutes, cases interpreting them and their effectiveness. (Gallagher-Florida)
W72-01004

AGREEMENT CONCERNING POLLUTION OF THE NORTH SEA BY OIL.
International Legal Materials, Vol 9, p 359-364, 1970. 6 p.

Descriptors: *International waters, *Water pollution control, *Oil, *Treaties, Pollution abatement, Oil wastes, Oily water, Transportation, Ships, Oil industry, International law, Legal aspects, Foreign countries, Geographical regions, Water pollution, Regulation, Cooperatives, Organizations.

Recognizing that oil pollution in the North Sea area presents a grave danger to the coastal states, these states agreed on procedures whereby they can cooperate on short notice to provide manpower, supplies, equipment, and scientific know-how to deal with the discharge of oil or other hazardous substances. The agreement applies whenever oil pollution presents a grave and imminent danger to the coast or related interests of the states. All parties are to inform the others about: (1) their national pollution control organization, (2) the authority responsible for implementing the agreement, and (3) new ways to control oil pollution. Upon learning of a potential hazard, each party shall inform all others without delay. Each state shall request the masters of their flag ships and pilots of their registered aircraft to report without delay and potential or present oil pollution problems. For purposes of the agreement, the North Sea was divided into six zones. Each party is responsible for assessing the nature and extent of an oil pollution danger in its zone and informing the other states of the necessary equipment and action to be taken. (Gallagher-Florida)
W72-01005

INTERNATIONAL CONVENTION RELATING TO INTERVENTION ON THE HIGH SEAS IN CASES OF OIL POLLUTION CASUALTIES.
International Legal Materials, Vol 9, p 25-44, 1970. 20 p, 1 append.

Descriptors: *Oil, *Water pollution control, *Remedies, *Treaties, Oil wastes, International waters, Oily water, Transportation, Ships, Oil industry, International law, Legal aspects, Foreign countries, Water pollution, Regulation, Cooperatives, Organizations, Water pollution sources, Damages, Accidents, Safety, Coasts, Oceans.

To protect the interests of their peoples against the grave consequences of oil pollution of the sea and coastlines, the states signing this convention have agreed that each state may take such measures on the high seas as may be necessary to prevent, mitigate, or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty which may reasonably be expected to result in major harmful consequences. Absent a case of extreme urgency, the state exercising the right must give notice to the flag state and independent experts approved by the organization. The measures taken shall not go beyond what is reasonably necessary to achieve the purposes of the Convention. In considering whether the measures are proportionate to the damage, account shall be taken of: (1) the probability of imminent damage, (2) the likely effectiveness of the measures, and (3) the extent of damage. If unreasonable measures are taken, the party must pay compensation. If the parties can not agree on the compensation, the dispute will be submitted just to conciliation, then arbitration. (Gallagher-Florida)
W72-01006

INTERNATIONAL CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION DAMAGE.
International Legal Materials, Vol 9, p 45-64, 1970. 20 p, 1 append.

Descriptors: *Ships, *Oil wastes, *International water, *Remedies, Oil, Oily water, Transportation, Oil industry, Treaties, International law, Legal aspects, Foreign countries, Water pollution, Water pollution control, Regulation, Cooperatives, Organizations, Water pollution sources, Damages, Accidents.

Convinced of the need to ensure the adequate compensation is available to persons who suffer damage caused by pollution resulting from the escape or discharge of oil from ships, the contracting states have agreed that, with minor exceptions, the owner of a polluting ship at the time of the incident shall be liable for any pollution damage caused by the excape or discharge of oil. When oil escapes from two or more ships, the owners of all ships concerned, unless exonerated, shall be jointly and severally liable for all such damage which is not reasonably separable. Unless the incident occurred as a result of the actual fault of the owner, he shall be entitled to limit his liability for one incident to 2000 francs for each ton of the ships tonnage or a total aggregate of 210 million francs. To avail himself of this limited liability, the owner must set up a fund representing the total limit of his liability. Other provisions are concerned with: (1) the control and distribution of the fund, (2) insurance or other financial security to cover potential liability, (3) a statute of limitations, and (4) recognition of judgments. (Gallagher-Florida)
W72-01007

CANADIAN LEGISLATION ON ARCTIC POLLUTION AND TERRITORIAL SEA AND FISHING ZONES.
International Legal Materials, Vol 9, p 543-552, 1970. 10 p.

Descriptors: *Foreign governments, *Arctic, *Ships, *Water pollution control, Water pollution, Water pollution sources, Water quality control, Waste disposal, International waters, Administration, Legislation, Legal aspects, Damages, Remedies, Pollution abatement, Adjudication procedure, Judicial decisions.
Identifiers: *Canada.

The purpose of Canada's Arctic Waters Pollution Prevention Act is to prevent pollution of arctic waters adjacent to Canada. The Act applies to waters within one hundred nautical miles seaward from land. The prohibition against waste deposits does not apply to deposits forming part of a water quality management area designated pursuant to

the Canada Water Act. Reports of waste deposits or danger thereof are required by masters of ships in distress and others. Civil liability attaches for violations for all costs of the government in remedying any condition and all damages incurred by others. Liability is absolute and is independent of proof of fault. Additionally, any person violating the Act is liable on summary conviction to a fine. The limitation period and procedures for recovery of claims are specified. Evidence of financial responsibility may be required. If proposed operations may result in waste deposits, the Governor may require specification of such operations. Whenever the Governor suspects a violation, he may seize the ship and its cargo. The court may, upon conviction, order that the ship and cargo be forfeited to Her Majesty in the right of Canada. (Shelnut-Florida)
W72-01008

CANADIAN PRIME MINISTER'S REMARKS ON THE PROPOSED LEGISLATION.

International Legal Materials, Vol 9, p 600-604, 1970. 5 p.

Descriptors: *Water pollution control, *Foreign countries, *International waters, *Arctic Ocean, *Jurisdiction, Shipping, Arctic, International boundary and water commission, Regulation, International law, Law of the sea, Polar regions, Oil industry, Water pollution, Legislation, Legal aspects.
Identifiers: *Canada.

Prime Minister Trudeau's comments to the press concerning legislation on Artic pollution, territorial seas, and fishing zones are reported in this transcript. Since current international law does not sufficiently protect countries from the pollution of international waters, Canadian legislation was proposed to prevent the pollution of Arctic waters adjacent to the Canadian Arctic. The proposed legislation provides that within a hundred-mile zone, Canada will exercise certain anti-pollution controls in an attempt to aid the development of international law. Although this is not an assertion of sovereignty, it is an exercise of Canada's desire to keep the Arctic free of pollution; the control zone is aimed at achieving this goal. Enforcement will be an assertion of the determination to control pollution, rather than an assertion of sovereignty. Subsequent regulations will determine what Canada will do within the zone. Perhaps regulations will be adopted concerning areas where there is shipping, oil exploitation, or where currents make pollution dangerous. International law which is favorable to navigation and commerce has been developed. Development, however, is needed in a new direction. Canada has indicated its willingness to participate in the development of international regimes to prevent coastal pollution. (Shelnut-Florida)
W72-01009

WATER POLLUTION,
S. F. Lewin, and C. J. Hartelius.
In: Law and the Municipal Ecology: Air, Water, Noise, Over-Population, p 109-200 (1970). 92 p, 400 ref, 3 append.

Descriptors: *Water pollution control, *Municipal wastes, *Sewage treatment, *Standards, Water quality, Effluents, Regulation, Legal aspects, Water law, Local governments, State governments, Federal government, Administration, Administrative agencies, Permits, Prior appropriation, Riparian rights, Water Quality Act, Rivers and Harbors Act, Jurisdiction, Public health, Water rights, Water pollution sources, Water pollution treatment.

As municipal wastes are the major source of water pollution, the various legal alternatives a city attorney can use in solving a water pollution problem are suggested. Included is a summary of: (1) general water pollution law, (2) federal laws and programs emphasizing the federal aid available to cities, (3) interstate compacts which can be created to solve water pollution problems, (4) state laws and regulations, and (5) local regulatory measures and common law remedies. The typical forms of state regulatory bodies and the constitutionality of state water pollution control legislation are described. The discussion of local regulation considers the extent to which municipalities can enact ordinances, enforce state statutes, and bring suits under the common law in preventing water pollution. Also analyzed are possible regulatory schemes for municipal water pollution control. Such schemes usually include both effluent and water quality standards. The private common law remedies, such as nuisance and trespass, are detailed, demonstrating the inadequacy in using them to solve complex problems of multiple polluters. (Johnson-Florida)
W72-01010

WATER CONSERVATION AND THE PETROLEUM INDUSTRY,
Louisiana Stream Control Commission, Baton Rouge.
R. A. Lafleur.
Institute on Mineral Law, Vol. 16, p. 17-18, 1970. 2 p.

Descriptors: *Louisiana, *Oil industry, *Water conservation, *Pollution abatement, Oil fields, Oil, Oil wastes, Chemical wastes, Industrial wastes, Water pollution sources, Water pollution, Legal aspects State governments, State jurisdiction, Administration, Administrative agencies, Water policy, Water resources, Water utilization, Saline water, Saline water intrusion.

The role played by the oil industry in Louisiana is considered in light of the problems this industry creates in the area of water conservation. Stream pollution from waste oil, wasted oil, spend caustic material, oil base drilling muds, and emulsifying agents discharged from drilling operations is one of the major problems faced by the state's water pollution control authority. Two regulatory agencies have been forced to issue harsh orders banning the discharge of salt water into fresh water streams and requiring subsurface injection of produced brine. These orders seek to protect the domestic water supply and to reduce salt water concentrations, which were approaching sea water levels, thereby insuring the survival of fish and other aquatic life in recreational areas. As a result of these orders, 80% of the brine produced in the state is being injected into subsurface strata. Other problems specifically recognized include: (1) control and abatement of pollution in coastal areas, (2) losses of chemicals in oil refinery operations, and (3) off-taste and odor in potable water supplies. (Horwitz-Florida)
W72-01011

THE OIL INDUSTRY AND MULTIPLE USE OF THE COASTAL MARGIN,
Fulbright, Crooker, Freeman, Bates, and Jaworski, Houston, Tex.
D. S. Browning.
Institute on Mineral Law, Vol. 16, p. 35-48, 1970. 14 p, 34 ref.

Descriptors: *Coasts, *Water quality control, *Beneficial uses, *Oil industry, Oil, Water pollution control, Oil wastes, Water pollution, Pollution abatement, Water pollution sources, Water pollution treatment, Water utilization, Administration, Coastal structures, Water management (Applied), Industries, Fishing, Offshore platforms, Legislation, Federal jurisdiction, State jurisdiction, Legal aspects, Administrative agencies.

Any system of coastal zone management must deal with a great diversity of related and often conflicting activities. The rapidly intensifying use of coastal areas already has outrun the capabilities of most local governments to plan orderly development and to resolve conflicts. Resolution of the conflict between offshore mineral activities and the fishing industry is especially difficult. Boundaries between state and federal jurisdiction are discussed. The recent oil leak in the Santa Barbara Channel illustrates the legal and political problems faced by the offshore petroleum industry. The repercussions of the oil spill are analyzed, along with regulations promulgated in response thereto. Recommendations of the President's Commission on Marine Sciences, Engineering and Resources include proposals for coastal water management through state coastal authorities. According to the Commission, coastal zone authorities should be organized to prevent domination by state agencies having narrower responsibilities. The main purposes of the coastal authorities should include fostering the widest possible variety of beneficial uses. Offshore regulations are needed which are fair and workable for all concerned, rather than overly biased against the oil industry. (Smilhanich-Florida)
W72-01012

REVENUE RULING 70-186: EXEMPTION FROM TAX ON CORPORATIONS.
For primary bibliographic entry see Field 06C.
W72-01014

CERTAIN SALT WATER POLLUTION OF UNDERGROUND WATER SUPPLY IS AN INVOLUNTARY CONVERSION FOR PURPOSES OF SECTION 1033 OF THE INTERNAL REVENUE CODE OF 1954.
For primary bibliographic entry see Field 06C.
W72-01015

ENVIRONMENTAL CONTROL PROBLEMS AND THE OIL INDUSTRY IN THE ROCKY MOUNTAIN REGION,
C. R. Hampton.
Rocky Mountain Mineral Law Institute, Vol 15, p. 621-684, 1969. 81 ref.

Descriptors: *Oil industry, *Water pollution control, *Political aspects, *Environment, Legislation, Federal government, State governments, Legal aspects, Air pollution, Water pollution, Pollution abatement, Water pollution sources, Rivers and Harbors Act, Planning, Permits, Standards, Inspection, Oil fields, Oil, Oil wastes, Public health, Water quality, Water conservation.

A detailed examination of federal legislation in the pollution control area is made. The Rivers and Harbors Act of 1899, the Oil Pollution Act of 1924, and recent water pollution control acts are analyzed with attention focused upon the effect of this legislation on the oil industry. The federal enforcement authority exercised by the Water Pollution Control Administration is also discussed. The effects of federal air pollution control acts such as the Clean Air Act and the Air Quality Act are considered through analysis of the control techniques, air quality standards, and enforcement procedures employed. Special attention is given to the pollution control problems of the oil industry, specifically: (1) oil field involving problems with brakish waters and oil disposal, (2) the air and water pollution problems facing the oil refineries, (3) oil spillage problems facing the pipeline companies, and (4) new problems facing the oil industries marketing departments. Strong administration and enforcement of state pollution control laws are needed, along with oil industry representation and action in this area. (Horwitz-Florida)
W72-01016

THE WATER DEGRADATION POLICY,
Glassie, Pewett, Beebe and Shanks, Washington, D.C.
W. W. Wolf.
Journal of Maritime Law and Commerce, Vol. 2, No. 4, p. 843-870, Jul 1971. 80 ref, 2 append.

Descriptors: *Water quality control, *Standards, *Degradation (Stream), *Water policy, Water pollution, Streams, Water pollution control, Pollution abatement, Water quality, Federal government,

State governments, Legislation, Classification, Federal-state water rights conflicts, Water pollution treatment, Pollutants, Waste disposal, Legal aspects, Federal jurisdiction, Water pollution sources.
Identifiers: *Water Pollution Control Act.

The Federal Water Pollution Control Act provides for the establishment of water quality standards. These standards assign the interstate waters of a state to water quality classes with established criteria. A problem has arisen as to waters presently above their class criteria. Some pollution, termed degradation, could be allowed in these waters without violating the standards. The water degradation policy of the federal government is analyzed. The government has chosen to further the Act's policy by demanding that existing water quality be preserved wherever it was above the adopted standards. The need to protect streams which were improperly put into too low water quality classifications was the prime factor behind the degradation policy. Opposition to the policy is analyzed. The degradation policy has been challenged as being a national water quality standard. Disadvantages of the policy include a conflict between state and federal government and an increase in enforcement problems. Factors considered in requests for permission to degrade are discussed, along with the scope of federal jurisdiction, exceptions to the policy, and the burden it has created. The policy indicates that the federal government is committed to strict water quality standards. (Smiljanich-Florida)
W72-01017

THE EXTERNALITIES OF A TORREY CANYON SITUATION; AN IMPETUS FOR CHANGE IN LEGISLATION,
McCarty and Noone, Washington, D. C.
H. J. McGurren.
Natural Resources Journal, Vol. 11, No. 2, p. 349-372, April 1971. 24 p, 7 fig, 70 ref.

Descriptors: *Ships, *Legislation, *Economic justification, *Disasters, *Oily water, Oil wastes, Economics, Resource allocation, Water pollution sources, Water pollution control, Risks, Damages, Navigable waters, Harbors, Coasts, Market value, External dis-economies, Costs, Prices, Legal aspects, Regulation, Insurance, Rivers and Harbors Act, Transportation.
Identifiers: *Water Quality Improvement Act of 1970.

The efficient allocation of resources to prevent and clean up oil spills depends upon the interplay of market forces. Inefficiency results from a failure of the market mechanism to reflect in prices the risks of oil transportation, thereby leading to overproduction and overconsumption of oil products. A suggested solution is intervention by legislative regulation or taxation imposing the actual costs of 'technological externalities' on polluters. United States legislation, like the New York Harbor Act and the Rivers and Harbors Act of 1899, imposes penalties to compel the allocation of resources toward preventing oil spills and minimizing damages. Suggested remedies for the failure of the market mechanism include legislation imposing a strict liability for consequential damages and requiring potential polluters to carry compulsory insurance covering all probable damages. Premiums would be adjusted to reflect the risk of pollution from each proposed activity. Application of these remedies is discussed. The Water Quality Improvement Act of 1970 represents a major effort to place oil pollution costs on the polluter. Its provisions are outlined, and limitations on its effect are discussed in light of suggested alternative provisions. (Rees-Florida)
W72-01018

INTERNATIONAL LAW AND MARINE POLLUTION: RADIOACTIVE WASTE AND 'OTHER HAZARDOUS SUBSTANCES',
University Coll., London (England).
For primary bibliographic entry see Field 05B.
W72-01019

ECOLOGY, ENVIRONMENT, INSURANCE AND THE LAW,
L. W. Allen, T. L. Ashcraft, H. Caldwell, W. W. Dodge, and T. Fitzsimmens.
Federation of Insurance Counsel, Vol. 21, No. 2, p. 37-63, Winter 1970-71. 27 p.

Descriptors: *Insurance, *Risks, *State jurisdiction, *Conferences, Compensation, Damages, Legal aspects, Economics, Federal jurisdiction, Legislation, Water law, Judicial decisions, Nonstructural alternatives, Water pollution, Water pollution control, Human population, Environment, Pollution abatement, Costs, Accidents.

This panel discussion was designed to inform counsel for insurance companies of the variety of problems which might arise in the course of pollution litigation. These problems include the determination of the applicable statute of limitations and of the extent of policy coverage. For the most part insurers are currently providing coverage only for the consequences of the unexpected or unintended discharge or escape of pollutants, except that even in such cases some companies now exclude oil pollution. One of the questions of coverage is whether the failure on the part of the insured to take adequate precautions to prevent injury or damage to others amounts to an accident. When defending industrial or commercial plants, counsel should always consider the questions of jurisdiction and venue. The Federal Water Pollution Control Act has recommended that appropriate state action be utilized for enforcement of its provisions. Counsel should also consider the use of a conference to resolve disputes which arise over pollution and should remember that most injunctive relief is prohibitory rather than mandatory. (Johnson-Florida)
W72-01020

WATER QUALITY CONTROL IN CALIFORNIA: CITIZEN PARTICIPATION IN THE ADMINISTRATIVE PROCESS,
K. Phaler.
Ecology Law Quarterly, Vol. 1, No. 2, p. 400-425, Spring 1971. 185 ref.

Descriptors: *California, *Water policy, *Administrative decisions, *Watersheds (Basins), Legislation, Legal aspects, Water law, Administration, Administrative agencies, Regulation, Water quality control, Water pollution control, Jurisdiction, Decision making, Institutions, Management, Planning, Standards, Water resources development, Adjudication procedure.

The administrative structure established for the regulation of water quality consists of the State Water Resources Control Board and nine regional boards. Implementation of state water policies is the primary responsibility of these regional boards whose boundaries follow the divisions of major watersheds. The definitions given by a water pollution control statute to such words as waters, wastes, and pollution and the implications of such definitions are discussed. The definition of beneficial uses includes the esthetic enjoyment of clean water. The enforcement powers of a regional board and the appellate role of the State Board are analyzed, along with the extent of judicial review and enforcement available under the statute. The interrelationships between the state water quality control policy and both other state and federal agencies is studied to determine if one can operate in a manner contrary to the other. After discussing the problems and potentials of the water quality control law, the possibilities for citizen participation in the water quality decision-making process are explored. The most important means of such participation is through appearances at hearings to speak out on certain policies and regulations. (Johnson-Florida)
W72-01021

PUBLIC POLICY ON OIL - AN ECOLOGICAL PERSPECTIVE,
Conservation Foundation, Washington, D.C.
M. F. Baldwin.
Ecology Law Quarterly, Vol. 1, No. 2, p. 245-303, Spring 1971. 304 ref.

Descriptors: *Oil, *International waters, *Exploitation, *Environmental effects, Fuels, Oil wastes, Water pollution sources, Oily waters, Oil industry, Natural gas, Exploration, Drilling, United States, Law of the sea, Legal aspects, Water law, Oceans, Water pollution control, Regulation, Jurisdiction, Governments, Ecology, Continental shelf, Offshore platforms, Coasts, Coastal structures.

The policy of the United States has been to encourage the increased exploitation of petroleum resources, and this increase will leave less time to find workable substitutes for fossil fuel. Any policy decision in this area should assure minimal detriment to the environment. There has been a shortage of low sulphur residual oil and natural gas, despite a rising need for such fuel to decrease sulphur dioxide pollution. This article considers the environmental costs of oil dependency and possible alternatives thereto. The author assesses the ecological effects of oil production and transportation and outlines our basic oil import policy to demonstrate the lack of environmental consideration embodied therein. The ecological effects of oil in the oceans are considered, with special emphasis on oil pollution from ships and offshore facilities and the regulation of such pollution. Regulation of the location of seacoast oil processing facilities and the Maine experience in this area are also discussed. The article recommends both a drastic change in national attitudes toware oil consumption and an international regulatory agency to determine the proper methods for enforcement, monitoring, standards-setting, and research in conjunction with international water quality standards. (Johnson-Florida)
W72-01022

ENVIRONMENTAL PROBLEMS OF THE OCEANS: THE NEED FOR INTERNATIONAL CONTROL,
Supreme Court, Washington, D.C.
W. O. Douglas.
Environmental Law, Vol. 1, No. 2, p. 149-166, Spring 1971. 64 ref.

Descriptors: *Law of the sea, *International waters, *Continental shelf, *International law, Fish harvest, International commissions, Treaties, Foreign waters, Water law, Legal aspects, Oceans, Oceanography, Fish conservation, Ecology, Water resources development, Political constraints, Social constraints, Aquatic environment, Environmental effects, Water rights, Environmental sanitation, Regulation, Water pollution control, State jurisdiction, Jurisdiction.

This article details some of the environmental problems confronting the biosphere. Some of these problems effect the ocean environment directly and include ocean dumping, unrestrained depletion of fish populations, and the development of seabed resources. International law is then examined to determine how it might aid in the solution of these problems. The problems of the oceans might be more easily solved if the jurisdiction of the coastal states was established at the low water mark. The traditional view of jurisdiction gives the states paramount rights in the territorial waters, thus barring international regulation in these areas. Without international regulation, the coastal states are free to carry on any activities without regard for the effects of these activities. Changes in the existing international law governing territorial waters are possible through treaties, conventions, or changes in the custom of recognizing the present limits on territorial waters. The most difficult task in finding a solution to the ocean's environmental problems is that of changing political attitudes and the relations among people the world over. (Johnson-Florida)
W72-01023

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
V. J. Yannacone.
Environmental Law, Vol. 1, No. 1, p. 8-32, Spring 1970. 136 ref.

Descriptors: *Project planning, *Federal project policy, *Environmental effects, *Federal government, Legislation, Legal aspects, Water law, Administrative agencies, Third party effects, Administration, Planning, Coordination, Estimated costs, Methodology, Political aspects, United States, Water pollution control, Water pollution sources, Pollution abatement.
Identifiers: *National Environmental Policy Act.

The legislative history and the meaning of the National Environmental Policy Act is detailed with a section-by-section breakdown. The most important effect of the Act is to provide all agencies and federal officials with a legislative mandate and a responsibility to consider the consequences of their actions on the environment. The national policy declared by the Act is to do what is necessary to create and maintain conditions under which man and nature can exist in productive harmony. The Act requires that all federal agencies shall, to the fullest extent possible, consider the environmental aspects of any major proposal, utilize the expertise of other agencies, and prepare a detailed statement of the environmental impact of a proposed action. It should strengthen the rights of the public to access to records and information of federal agencies that are relevant to environmental considerations. Federal agencies must comply with the provisions of the Act unless it clearly conflicts with their existing statutory authority and duties. Under the Act, a private citizen should have standing to seek review of any action not taken in accordance with the Act. (Johnson-Florida)
W72-01024

AN ENVIRONMENTAL PROGRAM FOR AMERICA,
Senate, Washington, D. C.
E. S. Muskie.
Environmental Law, Vol. 1, No. 1, p. 2-7, Spring 1970. 6 p, 4 ref.

Descriptors: *Legislation, *Non-structural alternatives, *Water pollution control, *Environmental sanitation, Environmental effects, Administration, Federal government, Legal aspects, Public rights, Administrative agencies, Competing uses, Economics, Jurisdiction, Project planning, Public health, Regulation, Water quality act, Water resources development, Clean air act, Waste treatment, Water pollution effects, Environment, Adoption of practices.

Although some things have been done to aid the solution of environmental problems, the continued increase of such problems indicates that an overall environmental protection program is needed. This article proposes a two-stage program. The first stage encompasses actions dealing with the obvious and straightforward problems of pollution, the physical by-products of our activities and production. The second stage is two-fold: it involves the organization of public institutions to deal with such subtle and pervasive questions as land and resource use, population distribution and industrial location, ecological balances, and urban design. It also involves educating citizens about the environment and encouraging their active participation in community environmental protection programs. Some work has been done on the first stage, but much remains to be done on the second stage. Proposals have been made to: (1) form a joint congressional committee and a single executive agency to deal with environmental quality problems, (2) to allow private citizens to bring class actions to enforce air and water quality standards, and (3) to develop a means of educating the public on environmental problems. We have resources, facts, and opportunity before us to win the environmental war. Let us begin today. (Johnson-Florida)
W72-01025

PUBLIC LAND POLICY AND THE ENVIRONMENT, VOLUME 2, PART II ENVIRONMENTAL PROBLEMS ON THE PUBLIC LANDS. SUMMARY STATEMENT AND CASE STUDIES 1 THROUGH 8,
Rocky Mountain Center on Environment, Denver, Colo.
R. P. Hansen, W. A. Hillhouse, B. E. Willard, and H. D. Burke.
Available from National Technical INFORMATION Service asPB-196 169, $3.00 in paper copy, $0.95 in microfiche. December 1970. 402 p, 137 fig, 3 map, 34 photo, 5 tab, 246 ref, 12 append.

Descriptors: *Water pollution control, *Lumbering, *Grazing, *Mineral industry, Water law, Water pollution, Air pollution, Public lands, Public rights, Environment, Environmental effects, Environmental sanitation, Land use, Land resources, Natural resources, Land clearing, Land development, Land management, Erosion control, Road construction, Burning, Wildlife conservation, Legal aspects, Forest management, Mining.

Environmental case studies of the following areas and practices are presented: (1) Batholith Granite in Idaho; (2) Lake Tahoe; (3) the Henderson project in Colorado, a mining operation; (4) Shirly Basin in Wyoming, a mining operation; (5) copper pit mining composite in Arizona; (6) South Central Utah, a grazing area; (7) a timber cutting practice composite; and (8) a fire ecology composite. These case studies recite facts, discuss environmental impact, and consider problem origins, environmental considerations, and alternatives. A summary of all the case studies is provided in an attempt to define generally the areas discussed in all of the studies. Types of environmental problems and impacts are set forth, as are the legal, procedural and policy problems associated with environmental problems and impacts. Suggested alternative laws, regulations, policies, practices, and procedures for avoiding or mitigating environmental problems are presented. (Robinson-Florida)
W72-01026

INTERGOVERNMENTAL RELATIONS IN THE CONTROL OF WATER POLLUTION,
J. N. Kline.
Natural Resources Lawyer, Vol. 4, No. 3, p. 505-536, July 1971. 32 p. 149 ref.

Descriptors: *Water pollution control, *Water quality control, *Pollution abatement, *Jurisdiction, *Political constraints, Political aspects, Water pollution, Water quality, Federal government, State governments, Local governments, Cities, Interstate commissions, Interstate compacts, Legal aspects, Water resources, Water resources development, Water policy, River basin commissions, Federal jurisdiction, State jurisdiction, Institutional constraints.

The interrelationship between federal, state, local, and regional efforts to control water pollution are examined in this article. The role of the federal government is increasingly expanding. Federal regulation, however, is most effective when it is in cooperation with state and local efforts. One of the biggest problems of the States has been the number of state agencies involved. Recent statutes, however, give one agency broad discretion. Inter-state cooperation has sometimes been successful. Due to their limited resources, local governments have never been a paramount factor in state-wide or regional programs. Recent trends suggest regional solution to water pollution problems. Federal-interstate compacts, federal regional agencies, single federal administrators, and districts are discussed as possible water pollution control solutions. The federal government must continue to play a major role, but the states should be the nuclei of pollution abatement programs. The author recommends that regional pollution control programs be implemented and explains the role of regional institutions. (Robinson-Florida)
W72-01028

AN ECOLOGICAL PERSPECTIVE FOR ARKANSAS,
Arkansas Univ., Fayetteville. School of Law.
G. P. Smith, II.
Arkansas Lawyer, Vol. 5, No. 2, p 54-57, March 1971. 4 p, 22 ref.

Descriptors: *Arkansas, *Environmental sanitation, *Water pollution control, *Public rights, Legislation, Water law, Legal aspects, Water pollution, Water quality, Water qualtiy control, Regulation, Administration, Loans, Air pollution, Administrative agencies, Pesticides, Insecticides, Interstate rivers.

Arkansas must increase her statutory penalties for pollution. A more direct and less cumbersome definition of water pollution is therefore suggested. Statistics are presented concerning the amount of water pollution in Arkansas and the South. Some 71 billion dollars will be required in the next five years to repay the debt to nature. State tax incentives are needed to encourage industry to fight pollution. Manufacturers' financial responsibility for pollution control should be absorbed in the cost of production. The Arkansas State Pollution Control Commission must develop local control boards, and a state department of ecology is needed. The State Plant Board has the power to remove economic poisons from the markets. Arkansas should allow citizens to sue polluters for public nuisances on behalf of the general public. The author favors making the Buffalo River a National River and cessation of the Gillham Dam Project on the Cossatot River. The right to a clean, healthy, and aesthetically pleasing environment is a fundamental right guaranteed to all. Education as to the environmental crises is needed at elementary, secondary, and collegiate levels. (Robinson-Florida)
W72-01029

SOLID WASTE MANAGEMENT.
Washington Rev. Code Ann. secs. 70.95.010 thru 70.95.910 (Supp. 1970).

Descriptors: *Washington, *Solid wastes, *Waste disposal, *Treatment facilities, Water pollution, Water pollution control, Ultimate disposal, State governments, Local governments, Financing, Government finance, Administrative agencies, Administration, Permits, Legislation, Legal aspects, Public health, Planning.

Due to continuing technological changes and expanding industrial activities, traditional methods of solid waste disposal are inadequate. This legislation is intended to establish a comprehensive statewide program for solid waste handling. The primary responsibility for adequate waste handling is assigned to local governments. To aid local governments, technical and financial assistance and adequate planning shall be provided to assure compliance with minimum performance standards. An advisory committee is created to provide consultation to the Ecology Department concerning matters herein covered. The Department may adopt, upon review by the Committee, minimum functional standards. Additionally, each county, in cooperation with the cities, shall prepare a coordinated, comprehensive solid waste management plan. Procedural aspects of the plan are specified. After a plan is approved, no disposal site shall be maintained until a permit has been obtained from a health department. The dumping of solid waste is unlawful without a permit. A presumption of unlawful dumping arises whenever solid wastes contain three or more items bearing the name of one individual. (Shelnut-Florida)
W72-01030

AN INTERNATIONAL CONVENTION ON ENVIRONMENT COOPERATION AMONG NATIONS: PROPOSED DRAFT, POLICIES AND GOALS,
Oslo Univ. (Norway). Faculty of Law.
C. A. Fleischer.

Texas International Law Journal, Vol 7, No 1, p 73-88, Spring 1971. 16 p, 44 ref.

Descriptors: *Treaties, *International law, *Water pollution control, *International waters, Political aspects, Pollution abatement, Project planning, Jurisdiction, Federal government, Air pollution, Water pollution, Water pollution sources, Legal aspects, International commissions, Governments, Law of the sea, Foreign trade, Environment, Waste disposal, Public rights, Environmental sanitation, Regime.

An international environment convention would recognize the need for treating pollution problems on an international level. The main purposes of the proposed draft convention herein described are to draw up rules on the protection of the environment, acceptable to nations in the present world situation, and to establish the necessary machinery for international cooperation in the development of further rules and regulations. Each of the major sections of the proposed convention are described and evaluated. Articles 1 through 9 recognize that the right to an environment with reasonably clean air, soil, and water is one of the fundamental human rights which must be protected through pollution control. Articles 10 through 23 are concerned with the controls to be maintained at the national level. Articles 24 through 33 detail the jurisdiction of states concerning major types of pollution activity. Articles 34-42 deal with special rules on pollution which go beyond the jurisdiction of a state. Subsequent portions of the draft relate to the regulation of international trade and the organization of an international anti-pollution board. (Horwitz-Florida)
W72-01031

COMMON LAW REMEDIES AND PROTECTION OF THE ENVIRONMENT,
Tulane Univ., New Orleans, La. School of Law.
J. C. Juergensmeyer.
British Columbia Law Review, Vol 6, No 1, p 215-236, June 1971. 22 p, 68 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Remedies, *Riparian rights, Competing uses, Reasonable use, Relative rights, Water pollution, Water pollution sources, Air pollution, Water quality control, Industrial wastes, Municipal wastes, Land tenure, Water resources development, Environmental sanitation, Ecology, Social aspects, Judicial decisions, Legislation, Legal aspects.

An examination is made in this article of common law principles used in environmental cases, and their present and future effectiveness in terms of the present ecological context is evaluated. In view of the extent of literature on common law theories, each important theory is discussed in terms of a court decision or series of decisions which indicates its general use in environmental litigation. Nuisance theory has frequently been used to abate water pollution. The decisions, however, are confused and differ from state to state as to requisite standards. Trespass is often utilized in conjunction with nuisance and may be useful when a statute of limitations bars a nuisance action. In negligence actions, controversy centers around the balance between pollution prevention costs to the polluter and pollution damage costs to society and the particular plaintiffs. The possibility of a strict liability theory and the extent of riparian rights are explored, along with the various remedies available under common law actions. The basic question presented by the common law theories is the proper role of the courts in the advancement of societal interests. (Smiljanich-Florida)
W72-01032

WATER POLLUTION: CONSERVATIONISTS CRITICIZE NEW PERMIT PROGRAM,
R. J. Bazell.
Science, Vol 171, No 3967, p 266-268, January 15, 1971. 3 p.

Descriptors: *Permits, *Water pollution control, *Industrial wastes, *Regulation, *Rivers and Harbors Act, Political aspects, Administration, Administrative agencies, Legislation, Standards, Federal government, State governments, Jurisdiction, Legal aspects, Water pollution, Water pollution sources, Water pollution effects, Water quality control, Project planning.

This article considers the new federal program requiring permits for all industries discharging wastes into the nation's waterways. The program is based upon the 1899 Refuse Act, which prohibits the discharge of any refuse matter of any kind or discription into any waters, except under permit from the Army Corps of Engineers. Until the establishment of this new program, however, the Corps had issued few permits and the Refuse Act had been used primarily to aid navigation rather than control pollution. Currently the Refuse Act has been combined with other existing legislation to require all industrial dischargers to seek a permit from the Corps. The Corps, however, is not empowered to apply any standards in granting the permits, but merely forwards the applications to state authorities for approval. The Environmental Protection Agency also reviews the permit applications, but can do little more than apply the appropriate state standards. There are three major criticisms of the program: (1) the reliance upon state rather than federal standards, (2) possible interference with the Fish and Wildlife Coordination Act, and (3) fears of enforcement delays resulting in unchecked pollution. (Horwitz-Florida)
W72-01033

BRINGING POLLUTERS TO JUSTICE,
M. V. McIntire.
Ecology Today, Vol 1, No 1, p 48-51, March 1971. 4 p.

Descriptors: *Training, *Scientific personnel, *Project planning, *Legal aspects, Pollution abatement, Water pollution, Water pollution control, Water pollution sources, Water pollution effects, Water policy, Competing uses, Economics, Judicial decisions, Engineering, Sewage disposal, Sewage treatment, Waste disposal.

Pollution control is a complex problem that requires the combined efforts of the economist, scientist, engineer, and lawyer to reach a satisfactory solution. Realizing this need for coordination, planners at the University of Syracuse designed a program in which scientists, engineers, and lawyers attempted a joint solution of an actual community water pollution problem. The participating professors obtained student participants from their respective classes to provide the needed manpower. The problem was structured in the form of a lawsuit with one group of students on one side and another group on the opposing side. The problem selected was the pollution of Lake Onondaga created by the Onondaga County Municipal Sewage Treatment Plant, which serves the City of Syracuse and its environs. This article describes the manner in which the problem was handled, the difficulties that arose, and the solutions, both successful and unsuccessful, found for these difficulties. The problem ended in a mock trial which was designed to demonstrate that: (1) sufficient technical and scientific data is often already available to analyze many problems, (2) legal machinery now exists to abate or control pollution, (3) effective pollution control requires teamwork. (Horwitz-Florida)
W72-01034

A NEW 'ASSERTION OF RIGHTS',
R. Pardo.
American Forests, Vol 77, No 5, p 16, 18-19, 59-60, May 1971. 5 p.

Descriptors: *Conservation, *Political aspects, *Public rights, *Legislation, Legal aspects, State governments, Federal government, Water pollution, Air pollution, Pollution abatement, Water pollution control, Relative rights, Administrative agencies, Judicial decisions, Land tenure, Permits, Project planning, Environment, Water resources.

The present and future prospects for pollution control through legislative and judicial action are considered. The increasing number and effectiveness of private judicial remedies is expected to combat all forms of pollution. This prediction is based upon several elements that have already begun to appear in the United States. These elements include: (1) tougher anti-pollution and forestry laws, (2) citizens' rights to sue polluters, (3) a shifting of the burden of proof from the citizen plaintiff to the defendant polluter, and (4) the citizen's sharing of any fines imposed upon a defendant by the courts. Citizen litigation has already become a common event touching every conceivable environmental front. This increase in private actions started with the Scenic Hudson case, in which conservationists were given standing to sue. The article considers the various legal and financial problems that face conservative groups. The new activist environmental law groups, including the Environmental Defense Fund and the Natural Resources Defense Council, are given special attention. Finally, present and possible future legislation to expand the citizen's role in pollution abatement is considered. (Horwitz-Florida)
W72-01035

POLLUTION OF THE SEA BY OIL,
N. D. Shutler.
Houston Law Review, Vol 7, p 415-441 (1970). 27 p, 2 tab, 192 ref.

Descriptors: *Texas, *Oil wastes, *International law, *Remedies, Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Oil, Offshore platforms, Oily water, Oil industry, Ships, Damages, Legislation, Judicial decisions, Legal aspects, State governments, Federal government.

Pollution of the seas by oil is a growing hazard. While the shipping industry is the greatest of such polluters, offshore drilling is becoming an increasing threat. Shipping and offshore drilling as sources of oil pollution raise problems involving both domestic and international law. The federal courts exercise admiralty jurisdiction over maritime torts in this nation's territorial seas, while state law is generally applicable to pollution by offshore drilling within territorial waters. Coastal states have jurisdiction to prohibit activities in their contiguous zones, but they have no jurisdiction to punish violators. International cooperation is necessary for the control of continuing non-disaster sources of pollution. Regarding liability, coastal states are given under international law the right to prescribe law to prevent discharges on the contiguous high seas, but the right to punish is nonexistent. Various international conventions and local statutes are discussed. Negligence is the principle theory used to recover damages for oil pollution, but future development will probably see a shift toward strict or absolute liability. Other remedies, such as injunctions, removal, and damages, are also discussed. (Shelnut-Florida)
W72-01036

COMMENTS OF SIERRA CLUB ON PROPOSED PERMIT FORM TO BE USED BY THE CORPS OF ENGINEERS FOR DISCHARGE OR DEPOSIT INTO NAVIGABLE WATERS.
Sierra Club, San Francisco, Calif.

1971. 3 P.

Descriptors: *Waste disposal, *Permits, *Navigable waters, *Regulation, Federal government, Standards, Jurisdiction, Administrative agencies, Water pollution control, Water pollution sources, Project planning, Waste water disposal, Legal aspects, Supervisory control (Power), Evaluation.

The Sierra Club generally commends the permit form issued by the Corps of Engineers for the

discharge of wastes into navigable waters. There are, however, three criticisms of the form. First, the form fails to make clear that the issuance of a permit does not authorize injury to public property. The Club recommends that the form be rewritten to specify that the permit does not authorize any injury to private or public property or any infringement of federal, state, or local laws. The Club also urges that a provision be included to provide that the issuance of a permit is not intended to establish the standard of care at issue in negligence, trespass, nuisance, or other common law actions. The second criticism is aimed at paragraph 1 (m). This paragraph requires that the Secretary of the Army find an imminent hazard before revoking a permit. The Club believes the permit should be revocable solely within the discretion of the Secretary. At the very least, the standards should be something less than 'imminent hazard'. Finally, the Club wants to assure that all permits are frequently reviewed. (Horwitz-Florida)
W72-01037

TENNESSEE WATER QUALITY CONTROL ACT OF 1971.
For primary bibliographic entry see Field 06E.
W72-01038

POLLUTION OF WATERS OF STATE BY OIL.
For primary bibliographic entry see Field 06E.
W72-01039

POWER PLANT SITING.
For primary bibliographic entry see Field 06E.
W72-01040

AUTHORITY OF CABINET TO DENY OIL DRILLING PERMITS,
For primary bibliographic entry see Field 06E.
W72-01041

PRINCIPLES OF RESPONSIBILITY IN THE UNITED STATES AND THEIR IMPLICATIONS FOR INTERNATIONAL ORGANIZATIONS,
Iowa University, Iowa City. School of Law.
N. W. Hines.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 32-40. 9 p.

Descriptors: *Water quality control, *Legislation, *Federal government, *State governments, Legal aspects, River basins, Water quality, Water pollution, Water pollution control, Water pollution sources, Water pollution treatment, Financing, Government finance, Taxes, Pollutants, Pollution abatement, Standards, Water Quality Act, Regulation, Administrative agencies, Administration, Remedies, Industry.

Lessons for international regulation of environmental quality may be derived from experience in the United States in regulating water quality. Water quality management in the United States began after World War II; before that time, no federal water quality program existed and state programs were health oriented. Following an enormous but inadequate attempt by the states to combat pollution, the federal government enacted comprehensive legislation which still relies primarily upon state enforcement. The federal activity in water pollution has largely consisted of various financing programs. Although the federal-state team approach has worked quite well, there has been recent pressure to increase federal enforcement activity. The first implication from the United States experience concerning water pollution is specifying the particular level of water quality desired; little progress can be achieved until quality standards are specified in terms of scientific parameters such as dissolved oxygen or phosphate levels. Furthermore, interstate water pollution cannot be effectively remedied by the states; agencies should be organized on a problem-shed basis for maximum effectiveness. Centralization of agency responsibilities for various water pollution problems is desirable. (Hart-Florida)
W72-01042

THE INTERNATIONAL JOINT COMMISSION (U.S.-CANADA),
M. E. Welsh.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 77-84, 8 p.

Descriptors: *United States, *International joint commission, *Treaties, *Water pollution control, Foreign countries, Great Lakes, St. Lawrence River, Coordination, Legal aspects, Water pollution, Jurisdiction, Administrative agencies, Administration, Water levels, Boundary disputes.

The International Joint Commission was formed pursuant to the Boundary Waters Treaty to prevent and resolve disputes regarding the use of boundary waters between the United States and Canada. It has been described as the most developed organization dealing with problems of international cooperation in curbing transnational pollution. The treaty gives the Commission responsibilities in two categories. The first is to approve or disapprove proposals for use, obstruction, or diversion of boundary waters which would affect the natural level or flow of the waters on the other side. The second is to investigate and make recommendations on specific problems referred by either government. Procedures for applications and references are described. The Commission was also established to lift questions out of the hands of a series of temporary bodies charged with resolving only one particular problem. This permanent commission has developed a tradition of impartiality and a body of reasoned precedent. It achieves coordination by the creation of international technical boards to assist it. Thus it has remained a small and efficient agency. When the Commission approves an application, it usually appoints an international board of control to ensure compliance. (Shelnut-Florida)
W72-01043

THE ROLE OF THE UNITED NATIONS IN CURBING OCEAN POLLUTION,
G. G. Schram.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 84-90. 7 p, 11 ref.

Descriptors: *International law, *United Nations, *Water pollution control, *International waters, Legal aspects, Political aspects, Water pollution, Water pollution sources, Water pollution effects, Public health, Project planning, Governments, Jurisdiction, International commissions, Waste disposal, Ships, Treaties, Oceans.
Identifiers: Geneva Convention on the High Seas, Convention on Civil Liability for Oil Pollution Damage.

The United Nations has a definite interest in protecting the marine environment from pollution so as to conserve and increase the valuable food resources of the worlds oceans. Although the problem of marine pollution is an ecological and biological one, an international legal framework is necessary to effectively minimize and control pollution. Ocean pollution cannot be effectively dealt with unilaterally, but must be organized on a worldwide basis through the concerted actions of governments. Such a framework, however, is lacking today. No general principles of international law forbid the dumping of waste into oceans. Various existing United Nations activities and international agreements are considered, including: (1) the 1958 Geneva Convention on the High Seas, Article 25; (2) the 1969 Convention on Civil Liability for Oil Pollution Damage; and (3) certain United Nations' organizations and agencies. The political climate is now ready for effective pollution control regulation. Therefore, immediate action should be taken to establish an international marine pollution convention and organize a world-wide ocean pollution monitoring network. (Horwitz-Florida)
W72-01044

INTERNATIONAL AND NATIONAL REGULATION OF POLLUTION FROM OFFSHORE OIL PRODUCTION,
R. B. Krueger.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 127-146, 20 p, 97 ref.

Descriptors: *Oil, *Oil industry, *Water pollution sources, *Continental shelf, Legislation, Water law, Legal aspects, Natural gas, Oil fields, Oil wells, Oily water, Water pollution, Water pollution control, Pollutants, Rivers and Harbors Act, Coasts, Continental slope, Accidents, Damages, Federal government.

Vast resources of oil and gas are on our continental shelf, and these reserves will have to be developed to meet future demands. International regulation of the continental shelf is discussed. In actuality, offshore drilling is one of the least significant forms of water pollution, and oil spills are one of the least permanently degrading forms of pollution. If all oil was imported the danger of water pollution might increase, as oil spills from ships cause greater damage than offshore drilling. The United States has adopted the following policy objectives concerning the use of the outer continental shelf: (1) efficient resources management, (2) encouragement of private participation, (3) maximization of revenue to the federal government, (4) encouragement of multipe use of resources, (5) advancement of knowledge and development of technology, and (6) protection of environmental quality. The application of the Outer Continental Shelf Lands Act to this problem is explained, and various pollution legislation is discussed. Although development of offshore oil is necessary, other uses and values must also be protected. It is doubted that government or industry has put sufficient emphasis on this objective. The present context is a viable one for the effecting of necessary regulation. (Robinson-Florida)
W72-01045

NEW OCEAN DEVELOPMENTS - - THE NIXON PROPOSAL OF MAY 1970,
R. B. Krueger.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University of Law, New York, New York, p 159-171. 13 p, 29 ref.

Descriptors: *Water pollution control, *International waters, *Continental shelf, *Resource development, Water pollution, Water quality, Water quality control, Environmental sanitation, Water law, Legal aspects, International law, Law of the sea, Treaties, Coasts, Oceans, Beds, Beds under water, Continental margin, Continental slope.

Legislation was introduced in Canada to establish an Arctic Waters Pollution Control Zone. All discharges that would degrade the water quality would be prohibited and strict liability imposed. A twelve mile territorial sea was also proposed. These proposals were challenged by the United States. President Nixon submitted a proposal which would do the following: (1) coastal nations would act as trustees of the continental margins beyond a depth of two hundred meters off their coasts, (2) coastal states would receive a share of the international revenues from the zone, (3) international machinery would be created to authorize and regulate use of seabed resources beyond the continental margins, (4) twelve mile territorial seas would be initiated, and (5) passage would be freed through international straits. This proposal of Nixon is politi-

cally clever, but it fails to take into consideration possible ecological hazards. Either a historic bay or straight baseline concept is necessary for coast management in the United States. American coastal states need jurisdiction over areas that are of functional importance to them. The Nixon proposal also does not give adequate recognition to interests of national coastal states over other uses of the seabed and oceans in the trusteeship territory. (Robinson-Florida)
W72-01046

THERMAL EFFECTS OF ELECTRIC PRODUCTION,
J. T. Conway.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 175-183. 9 p.

Descriptors: *Water pollution control, *Thermal pollution, *Nuclear powerplants, *Electric power production, Air pollution, Water pollution, Water pollution sources, Pollution abatement, Pollutants, Water quality, Water quality control, Environmental sanitation, Thermal powerplants, Thermal power, Steam, Fuels, Electric powerplants, Standards, Hydroelectric plants, Electric power industry, Federal government, State governments, Water law, Legal aspects, Electric power.

More than 80% of the electricity in this country is generated in steam electric plants dependent on coolant water; the remaining electricity is produced by hydroelectric and pumped storage plants. There are few remaining available hydroelectric sites. Fossil fueled plants produce more air pollution but less thermal water pollution. Nuclear plants, however, produce much thermal water pollution but practically no air pollution. Water coolant requirements are predicted for the future, and the roles of the federal government and state governments in settling water quality standards are explained. The following alternatives for decreasing adverse thermal effects are examined: (1) decreasing the rate of growth of electric demand, (2) better selective siting, (3) coolant towers, (4) holding ponds, and (5) more efficient thermal plants. (Robinson-Florida)
W72-01047

INTERNATIONAL CONTROLS OVER RADIOACTIVE WASTE DISPOSAL,
Columbia, Univ., New York.
Z. Slouka.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p 227-234. 8 p.

Descriptors: *Radioactive wastes, *Radioactive waste disposal, *Water pollution control, *Environmental sanitation, International law, International waters, Treaties, International commissions, Legal aspects, Water law, Regulation, Standards, Water pollution, Water pollution sources, Water quality, Water quality control, Oceans, Pollutants, Pollution abatement, Radiation, Radioactivity, Nuclear reactors.

Radioactive contaminants are being placed in the oceans, and there are now many nuclear powered vessels. Possible methods of reduction of radioactive contaminants in the oceans are discussed, such as tank storage, higher burnup in reactors, and treatment of radioactive wastes. International controls are needed. National shelf policing is the most common form of control. The International Atomic Energy Agency, International Commission on Radiological Protection, and the Intergovernmental Maritime Consultative Organizations may exert some control over radioactive ocean pollution. International custom and treaties are examined as methods of international control. These methods take a great deal of time and effort to implement. The provisions of technical and scientific information demonstrating the consequences of and alternatives to radioactive pollution should be the first step in international control, and this requires elevation of the international scientific establishments. Their task would not, however, be the recommendation of political measures, but the generation of apprehension. (Robinson-Florida)
W72-01048

ENFORCEMENT ACTIONS BY FEDERAL AGENCIES, INTERSTATE COMMISSIONS AND PRIVATE CITIZENS,
Department of the Interior, Washington, D.C.
R. W. Thieme.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University Law School, New York, New York, p 303-308. 6 p.

Descriptors: *Water pollution control, *Waste treatment, *Environmental sanitation, *Water quality control, Federal government, State governments, Interstate commissions, Legislation, Administrative agencies, Regulation, Treatment facilities, Construction, Grants, Government finance, Standards, Pollution abatement, Navigable waters, Industrial wastes, Municipal wastes, Oil wastes, Conferences, Project planning, Rivers and Harbors Act, Remedies.
Identifiers: *Water Pollution Control Act, Oil Pollution Act.

Enforcement actions can play an important part in any pollution control or abatement program. However, present enforcement capabilities are somewhat inadequate. The Federal Water Pollution Control Act declares the roles of the state and federal governments in water pollution control. The federal role is to support technical research and provide financial assistance to state, interstate, or municipal agencies. The Act outlines available enforcement measures and establishes a system of water quality standards for the states. Enforcement depends upon conferences, open hearings, and judicial action. Alternate enforcement possibilities include the Oil Pollution Act of 1924 and the Refuse Act of 1899. Inadequacies in existing legislation would be remedied by the President's proposed legislation providing that: (1) federal jurisdiction be extended, (2) existing state-federal water quality standards be amended to impose precise effluent requirements, (3) the Secretary of the Interior be given new legal enforcement powers, (4) fines be imposed against industrial and municipal polluters, (5) the Secretary of the Interior be authorized to seek immediate injunctive relief in emergency situations, (6) federal grants be tripled over five years, and (7) the 'Environmental Financing Authority' be established to purchase unsold waste treatment construction bonds. (Rees-Florida)
W72-01049

ENFORCEMENT NOW,
Interstate Sanitation Commission, New York.
T. R. Glenn, Jr.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University Law School, New York, New York, p 309-313. 5 p.

Descriptors: *Water pollution control, *Interstate commissions, *Financing, *Standards, Water pollution, Water pollution sources, Water quality, Water quality control, Pollution abatement, Administrative agencies, State governments, Local governments, Federal government, Allotments, Government finance, Legal aspects, Regulation, Remedies, Adjudication procedure, Administrative costs.

The state and interstate programs in water pollution abatement must now move, with most of their emphasis on enforcement. An extremely tough policy must be followed, and there must be full cooperation between local, state, interstate and federal agencies if we intend to reach any of the goals we have set for ourselves. However, the author indicates that there are obstacles to enforcement, such as: (1) small congressional appropriations, (2) judicial attitudes toward enforcement agencies, (3) the problems of legal proof until effluent standards replace stream standards, (4) court delays, (5) court action timed so that an agency becomes part of a political campaign, (6) reports of exotic treatment methods that are not commercially feasible, (7) neighborhood opposition to location of treatment plants, and (8) various inconsistencies in enforcement and funding. The enforcement powers available to the Interstate Sanitation Commission and other additional enforcement actions are detailed. In summation, water quality will be greatly improved in many areas of the country, but state and federal governments must immediately find a financial means of assistance to speed abatement. (Gallagher-Florida)
W72-01050

THE ROLE OF PRIVATE ACTIONS IN POLLUTION ABATEMENT,
D. Sive.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University Law School, New York, New York, p. 317-320. 4 p, 1 ref.

Descriptors: *Jurisdiction, *Public rights, *Water pollution control, *Damages, Water rights, Costs, Legal aspects, Water law, Administration, Administrative agencies, Federal government, Judicial decisions, Governments, Legislation, Negotiation, Non-structural alternatives, Regulation, Water pollution, Pollution abatement, Adjudication procedure, Water quality control.

The role of private suits and private actions has not been very important in the field of pollution abatement but the situation may change in the future. Among the reasons for the lesser importance of citizen suits are: (1) most environmental suits by citizens arise from the participation of individuals or organizations in administrative proceedings and subsequent appeals to the courts, (2) in the field of pollution there is generally no proceeding in which private citizens can play a role, and (3) where pollution creates rights of private citizens, it also creates rights of action by governmental agencies, who usually act first. Recent proposed federal legislation has attempted to overcome the problems involved in private citizen's actions. These problems include: (1) the jurisdictional requirement of an amount in controversy of $10,000, (2) the defense of sovereign immunity raised by governmental defendants, and (3) the financial burden of bringing a private action. Other possibilities for increasing the role of the citizen are to increase the scope of allowable damage and nuisance actions and to increase the ability of citizens to compel federal agencies to act in pollution situations. (Johnson-Florida)
W72-01051

THE QUEST FOR ENVIRONMENTAL QUALITY: FEDERAL AND STATE ACTION, 1969-70.
Advisory Commission on Intergovernmental Relations, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.35. 1971. 63 p, 1 tab, 216 ref.

Descriptors: *Legislation, *Bibliographies, *Environmental sanitation, *Water resources development, Federal government, State governments, Legal aspects, Water law, Administration, Water Quality Act, Clean Air Act, Environment, Water pollution control, Water pollution sources, Oil, Ecology, Waste disposal, Shore protection, Political aspects.

Recent widespread concern for the totality of man's environment has generated a public outcry against pollution and misuse of our natural resources. Federal and state governments have

reacted to this outcry through attempts to reorganize their efforts for a comprehensive approach to protection of the environment as a whole and to strengthen control and management of natural resources. This volume reports on the legislative and administrative actions of Federal and state governments during 1969-70 and provides an annotated bibliography of sources of information on environmental quality control. Federal action during the period considered include the National Environmental Policy Act, Water Quality Improvement Act, and the Clean Air Amendments. State actions include: (1) basic policy pronouncements, (2) governmental reorganizations for pollution control, (3) increased financing for environmental improvements, (4) stricter air and water pollution control, (5) coordination and research for improved solid waste disposal, and (6) land use planning. The annotated bibliography is broken down into specific areas of the environment, such as air, water, power, shore protection, waste disposal, and noise. Also include in the volume is a table of citations to 1969-70 state environmental legislation. (Johnson-Florida)
W72-01052

POLLUTION: WILL MAN SUCCEED IN DESTROYING HIMSELF.
For primary bibliographic entry see Field 06E.
W72-01053

INTRODUCTION OF A BILL RELATING TO PENALTIES FOR OBSTRUCTION OF NAVIGABLE WATERS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-01054

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FOR ITS UNIFORM APPLICATION TO ALL OF THE NAVIGABLE WATERS OF THE UNITED STATES.
For primary bibliographic entry see Field 06E.
W72-01055

CLEAN WATER FOR PUERTO RICO'S ESTUARIES.

Summary, Puerto Rico Public Meeting, National Estuarine Pollution Study, Santurce, Puerto Rico, April 22, 1968, Federal Water Pollution Control Administration, Atlanta, Georgia, 14 p, 11 photo.

Descriptors: *Puerto Rico, *Water pollution control, *Estuaries, *Estuarine environment, *Water quality control, Water policy, Water resources, Water pollution, Water quality, Public health, Recreation, Industries, Education, Commercial fishing, Marine fisheries, Environmental sanitation, Water law, Legal aspects, Coasts, Estuarine fisheries.
Identifiers: *Clean Water Restoration Act.

The Clean Water Restoration Act of 1966 authorized the National Estuarine Pollution Study which is being conducted by the Federal Water Pollution Control Administration. Meetings were held in Puerto Rico to obtain the views and opinions of public and private groups and individuals having an interest in the Commonwealth's estuarine and coastal waters. A panel of experts was gathered to elicity additional information and views. Statements presented by various interests are summarized in seven categories: responsibility, research, public health, recreation, industry, commercial fishing, and education. (Robinson-Florida)
W72-01058

A REGULATION RELATING TO WATER QUALITY STANDARDS FOR INTERSTATE AND COASTAL WATERS OF THE STATE OF WASHINGTON AND A PLAN FOR IMPLEMENTATION AND ENFORCEMENT OF SUCH STANDARDS.

Washington Water Pollution Control Commission, Olympia, Washington, February, 1970. 22 p, 1 tab.

Descriptors: *Washington, *Water quality control, *Water pollution control, *Standards, Administrative decisions, Legal aspects, Water quality, Water pollution, Regulation, Pollutants, Environmental sanitation, State governments, Administration, Administrative agencies, Industrial wastes, Domestic wastes, Waste disposal, Monitoring, Planning, Coasts, Interstate rivers, Estuaries.
Identifiers: *Water Pollution Control Act.

The Water Pollution Control Commission of Washington promulgates water quality standards and implementation and enforcement plans in compliance with the Federal Water Pollution Control Act. Four classes of water quality with applicable water quality criteria are established. The interstate and coastal waters of Washington are classified into one of these four classes. General guidelines applicable to water quality criteria and calssifications are set forth. Characteristic uses to be protected are detailed. Existing discharges shall be modified so as to be consistent with these standards no later than five years from the effective date of this regulation. Implementation procedures are specified for domestic discharges, commercial and industrial operations, and miscellaneous waste discharges or water quality effect sources. Surveillance and enforcement programs are also detailed. (Robinson-Florida)
W72-01059

GEORGIA IS POLLUTED - THE RAW FACTS AND WHY - PART I.
J. E. Doherty.
Georgia Water Quality Control Board, April, 1970. 2 p, 1 photo.

Descriptors: *Georgia, *Pollution abatement, *Treatment facilities, *Sewage disposal, *Water pollution control, Water pollution, Water pollution sources, Administrative agencies, Administrative, Industrial wastes, Industries, Financing, Government finance, Federal government, Local governments, State governments, Taxes, Economic impact.

While less than twenty percent of Georgia's waters are severely polluted, virtually all of this pollution is located just below its cities. Historically, most Georgia cities have paid little attention to implementing pollution abatement programs adequate to cope with increasing amounts of waste. Today, the sheer volume of waste from Georgia's cities far exceeds the recovery capacities of local receiving streams. Consequently, water pollution has become an economic liability: new industries have rejected Georgia because of its inability to provide enough good quality manufacturing process water. Although the Georgia Water Quality Control Board has been seeking compliance with pollution control laws, abatement programs are far behind schedule. The inadequate number of waste treatment facilities has partially resulted from the insufficient tax base of most cities. While federal construction grants have been less than the amounts authorized, Georgia's aid to its own communities for the same purpose has been non-existent. An additional cause of inadequate pollution control is a lack of qualified plant operators. Now is the time to alert local officials to act decisively to combat local pollution problems. (Shelnut-Florida)
W72-01060

MISSISSIPPI AIR AND WATER POLLUTION CONTROL ACT.
Mississippi Code Ann. secs. 7106-111 thru 7106-136 (Supp. 1968).

Descriptors: *Mississippi, *Water pollution control, *Administrative agencies, *Supervisory control (Power), Administration, Legal aspects, State governments, State jurisdiction, Water pollution, Water quality, Water quality control, Public health, Legislation, Permits, Standards, Inspection, Waste disposal, Air pollution, Treatment facilities.

The framework for a Mississippi water pollution control system is herein established. The policy behind this legislation is to conserve the air and water of Mississippi and to protect, maintain and improve the quality thereof for public use. General definitions are included. These cover such terms as: pollution, wastes, sewage system, treatment works, air contaminant, and air pollution. The Mississippi Air and Water Pollution Control Commission is created. The Commission's organization is detailed. A full-time Executive Secretary shall be appointed by the Commission. The powers and duties of the Commission are established. The authority to promulgate water quality standards is vested in the Commission. Prohibitions against pollution of the air and water are enumerated and made unlawful in the absence of a permit issued by the Commission. Procedures are detailed for: proceedings before the Commission, public hearings, inspections, investigations, and the maintenance of records. Emergency rules and penalties for violations are set forth. (Horwitz-Florida)
W72-01061

REGULATION OVER SITING AND DESIGN OF POWER PLANTS,
Indiana Univ., Indianapolis. School of Law.
For primary bibliographic entry see Field 06E.
W72-01062

RULES AND REGULATIONS GOVERNING THE OPERATION OF WATER POLLUTION CONTROL FACILITIES.
Oklahoma State Dept. of Health, Oklahoma City.

March, 1969. 5 p, 1 tab.

Descriptors: *Oklahoma, *Sampling, *Standards, *Water quality control, *Monitoring, Treatment facilities, Laboratories, Water pollution, Water pollution control, Regulation, Legislation, Legal aspects, Waste disposal, State governments, Local governments, Laboratory tests, Water analysis, Administratives agencies, Administrative decisions, Investigations.

The purpose of these Oklahoma regulations governing the operation of water pollution control facilities is to: (1) establish minimum guidelines for control tests, laboratory checks, and operating records to provide data to be used as a basis for plant operation or design improvements; (2) assure adequate protection of the public health; (3) prevent and control nuisances; and (4) determine compliance with standards established in accordance with the Water Quality Act of 1965. While these regulations are minimum requirements, additional tests will be required to control plant operation. Provisions for laboratory equipment and supplies are specified to avoid damage or misuse of equipment or interference with laboratory procedures. Daily flow measurements shall be determined and entered in the operating records for all plants. Additionally, minimum control tests are herein tabulated. Requirements for bypassing lift stations and control plants are specified. In order to determine compliance with standards, stream standards should be collected above and below the point of waste discharge. Provisions for operating records and reports are detailed. (Shelnut-Florida)
W72-01063

POLLUTION SPILLS AND BY-PASSES.
Kansas State Board of Health, Topeka.
For primary bibliographic entry see Field 06E.
W72-01064

LEGAL ASPECTS: PRIVATE REMEDIES FOR WATER POLLUTION,
Washington Water Research Center, Pullman.
For primary bibliographic entry see Field 06E.

W72-01065

SOME WATER QUALITY MANAGEMENT ASPECTS IN CALIFORNIA WATER RESOURCES DEVELOPMENT,
California Dept. of Water Resources, Sacramento.
N. D. Sturm.
In: Water Resources and Economic Development of the West, Report No. 12 Conference Proceedings, Committee on the Economics of Water Resources Development, Western Agricultural Economics Research Council, Salt Lake City, Utah, December 18-20, 1963. p. 63-71, 9 p.

Descriptors: *California, *Water quality control, *Administration, *Water resources development, Data collections, Monitoring, Planning, Water supply, Water users, Water utilization, Waste disposal, Waste treatment, Water pollution control, Water storage, Water pollution sources, Administrative agencies, Management, Public health, Social values, Cost-benefit analysis, Research and development, Land use, Standards.

Water quality management is essential to an efficient water resources development program. To maintain a specific level of quality at certain stream points, a program must identify sources of degradation and determine applicable standards for particular water uses. Objective analysis of pertinent factors must be supplemented by subjective factors such as reasonableness, social acceptance, and enforcability. Economic analysis is the best objective means to determine whether water quality conditions are approaching an optimum state. A successful management program requires implementation through proper organizational structure and financing methods, including: (1) a central agency to coordinate resource, health, and pollution-control agencies; (2) large governmental districts to implement regional planning and programs; and (3) direct user charges or ad valorem taxation to fund waste disposal programs. Research should examine the physio-technical and economic aspects of water quality concerning municipal, industrial, agricultural, recreational, and fish and wildlife uses. California's water quality management program, under the Department of Water Resources, is discussed in three phases: (1) the collection and evaluation of data, (2) water quality planning, and (3) regulation and control. (Rhees-Florida)
W72-01066

THE 1899 REFUSE ACT SHOULD BE ADMINISTERED BY ENVIRONMENTAL PROTECTION AGENCY,
House of Representatives, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-01068

WATER QUALITY ENHANCEMENT AWARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-01069

A BILL TO REQUIRE THAT VESSELS COMPLY WITH STANDARDS OF WASTE DISPOSAL PRESCRIBED BY THE SECRETARY OF TRANSPORTATION.

House Bill 10823, 90th Cong., 1st Sess. (1967). 2 p.

Descriptors: *United States, *Ships, *Standards, *Waste disposal, Water pollution, Water pollution sources, Water pollution control, Administration, Administrative agencies, Navigable waters, Pollutants, Damages, Legal aspects, Waste storage, Legislation.

The purpose of this bill is to require that vessels comply with standards of waste disposal prescribed by the Secretary of Transportation. The bill provides that the Secretary, after consultation with the Secretary of the Interior, shall prescribe and publish in the Federal Register standards for the treatment, storage, or both of wastes aboard vessels having toilet facilities, so as to prevent the further pollution of the navigable waters of the United States. No vessel constructed after January 1, 1969, which is equipped with toilet facilities, may be sold in commerce for use on any of the navigable waters of the United States unless such facilities comply with the standards prescribed and published by the Secretary. The bill requires that, after January 1, 1974, no vessel which is equipped with toilet facilities may be sold in commerce or used on any of the navigable waters unless such facilities comply with the standards prescribed and published by the Secretary. Whoever violates this act shall be subjected to a civil penalty not to exceed one thousand dollars for each such violation. (Shelnut-Florida)
W72-01070

WATER QUALITY IMPROVEMENT ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, RELATING TO THE CONSTRUCTION OF WASTE TREATMENT WORKS, AND TO THE CONDUCT OF WATER POLLUTION CONTROL RESEARCH).
For primary bibliographic entry see Field 06E.
W72-01071

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO CONTROL POLLUTION FROM VESSELS WITHIN THE NAVIGABLE WATERS OF THE UNITED STATES.
For primary bibliographic entry see Field 06E.
W72-01072

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO STRENGTHEN AND IMPROVE AUTHORITY TO ENFORCE ABATEMENT OF POLLUTION, TO PROVIDE FOR FILING OF NOTICE WITH RESPECT TO DISCHARGE OF MATTER INTO INTERSTATE OR NAV IGABLE WATERS AND TO REQUIRE PERMITS TO REGULATE SUCH DISCHARGE OF MATTER.
For primary bibliographic entry see Field 06E.
W72-01073

CLEAN RIVERS RESTORATION ACT OF 1966 (A BILL TO PROVIDE A PROGRAM OF POLLUTION CONTROL AND ABATEMENT IN SELECTED RIVER BASINS OF THE UNITED STATES THROUGH COMPREHENSIVE PLANNING AND FINANCIAL ASSISTANCE, TO AMEND THE F EDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W72-01074

PORTS AND WATERWAYS SAFETY ACT OF 1970 (A BILL TO PROMOTE THE SAFETY OF PORTS, HARBORS, WATERFRONT AREAS, AND NAVIGABLE WATERS OF THE UNITED STATES).
For primary bibliographic entry see Field 06E.
W72-01075

OFFSHORE PRODUCTION SAFETY ACT OF 1970 (A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF FURTHER POLLUTION BY OIL DISCHARGES FROM FEDERAL LANDS OFF THE COAST OF CALIFORNIA).
For primary bibliographic entry see Field 06E.
W72-01076

ENVIRONMENTAL MONITORING REPORT ACT (A BILL AUTHORIZING AND DIRECTING THE SECRETARY OF COMMERCE TO MAKE A REPORT TO CONGRESS ON ENVIRONMENTAL SYSTEMS, BOTH NATIONAL AND INTERNATIONAL).
For primary bibliographic entry see Field 06E.
W72-01077

REGIONAL WATER QUALITY ACT OF 1970 (A BILL TO PROVIDE A PROGRAM OF POLLUTION CONTROL IN SELECTED RIVER BASINS AND WATERWAYS OF THE UNITED STATES THROUGH COMPREHENSIVE PLANNING AND FINANCIAL ASSISTANCE TO MUNICIPALITIES).
For primary bibliographic entry see Field 06E.
W72-01078

A BILL TO AMEND THE ACT OF AUGUST 3, 1968 (82 STAT. 625), TO PROTECT THE ECOLOGY OF ESTUARINE AREAS BY REGULATING DUMPING OF WASTE MATERIALS, TO AUTHORIZE THE ESTABLISHMENT OF A SYSTEM OF SANCTUARIES, AND FOR OTHER PU RPOSES.
For primary bibliographic entry see Field 06E.
W72-01079

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT TO PROVIDE ADDITIONAL PROTECTION TO MARINE AND WILDLIFE ECOLOGY BY PROVIDING FOR THE ORDERLY REGULATION OF DUMPING IN THE OCEAN, COASTAL, AND OTHER WATERS OF THE U NITED STATES.
For primary bibliographic entry see Field 06E.
W72-01080

A BILL TO PROVIDE FOR A FEDERAL ECOLOGICAL PRESERVE IN A PORTION OF THE OUTER CONTINENTAL SHELF IN THE SANTA BARBARA CHANNEL AND TO PROVIDE FOR A MORATORIUM ON DRILLING OPERATIONS PENDING THE ABILITY TO CONTROL AND PREV ENT POLLUTION BY OIL DISCHARGES AND TO IMPROVE THE STATE OF THE ART WITH RESPECT TO OIL PRODUCTION.
For primary bibliographic entry see Field 06E.
W72-01081

CLEAN LAKES ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED, AND FOR OTHER PURPOSES).
For primary bibliographic entry see Field 06E.
W72-01082

A BILL TO PROHIBIT DISCHARGE OF ANY MILITARY MATERIAL OR OTHER REFUSE INTO NAVIGABLE WATERS OF THE UNITED STATES OR INTO INTERNATIONAL WATERS, AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 06E.
W72-01083

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS.
For primary bibliographic entry see Field 06E.
W72-01084

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO BAN POLYPHOSPHATES IN DETERGENTS AND TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SY NTHETIC DETERGENTS).
For primary bibliographic entry see Field 06E.
W72-01085

WATER QUALITY CONTROL BILLS,
For primary bibliographic entry see Field 06E.

W72-01086

PRESIDENT'S ENVIRONMENTAL PROPOSALS,
For primary bibliographic entry see Field 06E.
W72-01087

A BILL TO PROVIDE THE COAST GUARD WITH AUTHORITY TO CONDUCT RESEARCH AND DEVELOPMENT FOR THE PURPOSE OF DEALING WITH THE RELEASE OF HARMFUL FLUIDS CARRIED IN VESSELS.
For primary bibliographic entry see Field 06E.
W72-01088

MICHIGAN'S 'TRUTH IN POLLUTION' ACT 200.
For primary bibliographic entry see Field 06E.
W72-01089

A BILL TO AUTHORIZE THE COAST GUARD TO STUDY METHODS OF PREVENTING CASUALTIES INVOLVING VESSELS CARRYING CERTAIN CONTAMINANTS, TO CONDUCT CONTINUING RESEARCH ON THE REMOVAL OF CONTAMINANTS FROM BEACHES AND WATERS, THE E XAMINATION OF ROUTES USED BY VESSELS CARRYING CERTAIN CONTAMINANTS.
For primary bibliographic entry see Field 06E.
W72-01090

A BILL TO GIVE THE PRESIDENT AUTHORITY TO ALLEVIATE OR TO REMOVE THE THREAT TO NAVIGATION, SAFETY, MARINE RESOURCES, OR THE COASTAL ECONOMY POSED BY CERTAIN RELEASES OF FLUIDS OR OTHER SUBSTANCES CARRIED IN OCEANOGOIN G VESSELS.
For primary bibliographic entry see Field 06E.
W72-01091

A BILL TO REQUIRE FINANCIAL RESPONSIBILITY IN THE CASE OF OWNERS AND CHARTERERS OF VESSELS CARRYING OIL OR OTHER CONTAMINANTS, AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 06E.
W72-01092

CHICAGO LEADS FIGHT AGAINST PHOSPHATE POLLUTION--NOW CONGRESS MUST ACT,
House of Representatives, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-01093

A STATE APPROACH TO EFFLUENT CHARGE,
O. E. Delogu.
Maine Law Review, Vol 23, No 2, p 281-313, 1971. 33 p, 97 ref. OWRR A-019-ME (1).

Descriptors: *Maine, *Water pollution control, *Effluents, *Taxes, Water pollution, Water quality, Water quality control, Pollution abatement, Standards, Industrial wastes, Sewage effluents, Costs, Operating costs, Construction costs, Maintenance costs, Capital costs, Treatment facilities, Legal aspects, Legislation, Watersheds (Basins).

In order to enable effluent charges to be levied and used in Maine, proposals are made for a working set of arrangements which take cognizance of the existing constitutional, statutory and institutional arrangements in Maine. Effluent charges in each major watershed or river system must be measured by and allocated to the construction as well as capital, operating, maintenance and replacement costs of those waste water treatment facilities necessary to achieve the stream standards imposed. A uniform national effluent charge is an unwise approach since it cannot take into account variations in the physical characteristics of the waterbody. Therefore, in the majority of cases, a uniform effluent charge will result either in: (1) an overcharge, where more money is collected than is necessary to achieve pollution control; or (2) an undercharge, where not enough is collected to control pollution. Proposed legislation for the imposition and expenditure of effluent charges are analyzed on a section by section basis. The basic premise of this legislation is that effluent charges should be seen as a complementary enforcement mechanism to existing laws. (Gallagher-Florida)
W72-01119

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SAMPLE USES OF COMPUTERIZED SLOPE STABILITY SOLUTIONS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-00595

MATHEMATICAL MODELING OF WATER DISTRIBUTION SYSTEMS,
General Electric Company, Philadelphia, Pa. Reentry and Environmental Systems Div.
For primary bibliographic entry see Field 04A.
W72-00715

WATER RESOURCES PLANNING AND SOCIAL GOALS: CONCEPTUALIZATION TOWARD A NEW METHODOLOGY,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 06B.
W72-00796

VARIATION OF URBAN RUNOFF WITH DURATION AND INTENSITY OF STORMS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 04C.
W72-00816

THE POLITICAL EVALUATION OF ALTERNATIVE METROPOLITAN WATER-RESOURCE PLANS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06B.
W72-00852

THE PROPER PRACTICE OF SYSTEMS ANALYSIS.
Purdue Univ., Lafayette, Ind. School of Engineering.

Purdue University School of Engineering Backgrounder. p 5-6. OWRR A-012-IND (1).

Descriptors: *Optimum development plans, *Simulation analysis, *Computer models, Resource allocation, Watershed management, Economic justification, Water quality control, Operations research.
Identifiers: *Wabash River Basin.

The systems methodology integrates the scientific approach with elements of economics, sociology, and public policy. This article discussed the systems approach as it was applied to the overall problem of the reservoir system in Indiana's Wabash Basin. The objective was to learn how to optimally operate the present (and possible future) system given the environmental, social and economic factors. Using operational policies as inputs, several models were developed which considered various combinations of outputs such as water quality and quantity, net benefits for recreation, flood control, waste dilution, irrigation water, shipping potential, associated land use and cooling capacity in connection with power production. The study attempted to model the consequences of alternative courses of action in operating the reservoir system and to express those consequences in terms which the public can understand. It was concluded that the use of systems analysis techniques can facilitate the rational use of resources. (Markell-Cornell)
W72-00853

MODELING A RIVER.
Purdue Univ., Lafayette, Ind. School of Engineering.

Purdue University School of Engineering Backgrounder. p 4-5. OWRR A-013-IND (1).

Descriptors: *Simulation analysis, *Computer models, *Dissolved oxygen, *Biochemical oxygen demand, *Pollution abatement, Reaeration, Photosynthesis, Waste water treatment.
Identifiers: *Wabash River Basin.

Discussed was the development of a water quality simulation model for the Wabash River capable of indicating, without experimentation, what is needed to correct existing pollution problems and to prevent future problems. Wile the Wabash model itself is not applicable to other rivers, the methodology for developing it is. The level of dissolved oxygen was used to determine the water quality. Water quality parameters were reaeration, the biochemical oxygen demand removal coefficient and the production of oxygen by algae in the river. Using the data from the three factors, a model was developed which showed, given waste loadings and flow characteristics, the dissolved oxygen and the BOD at 1/4 mile intervals along the stream. Past pollution conditions were predicted by using data on actual past flow and loading. The model revealed significant and surpising findings. As it now stands, the model can be utilized to indicate the necessary steps for solving a pollution problem and will be expanded to include economic, social and political factors.
W72-00854

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING ALGORITHM TO POLLUTION CONTROL,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W72-00856

PLANNING FOR POLLUTION CONTROL - A CRITICAL SURVEY,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W72-00857

AN INVESTIGATION OF MIXED METHODS FOR THE SOLUTION OF SIMULTANEOUS NONLINEAR EQUATIONS,
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
R. L. Dobson.
M.S.Thesis, Clemson University, December 1970. 89 p, 18 fig, 7 tab, 10 ref. OWRR B-006-SC (3).

Descriptors: *Mathematical models, *Computer programs, *Analog computers, *Digital computers, *Simulation analysis, Equations, Mathematics, Analytical techniques.

In the field of engineering many problems arise which when formulated result in a set of simultaneous nonlinear equations. Unless these equations are of the simplest order, no analytical technique is available by which the solution set may be obtained in a straight-forward manner. The objective was to investigate those available techniques which utilize

iteration to arrive at a solution set and determine the advantages and disadvantages of each. Several methods were investigated. At least one technique from each major area was tried on the analog and/or digital computers to gain an idea of the relative merits of each category. Among these were a pure analog method, a pure digital technique, a hybrid scheme, and a combination of simulated analog (integration) and digital (iteration) on the digital computer. The EAI TR48 analog computer, IBM S/360, Model 40 digital computer and the DEC, PDP-8 and PDP-15 digital computers were used to implement the procedures of the methods investigated. The analog and hybrid techniques proved unwieldly from the standpoint of equipment and patching time required; the integration-iteration approach was unsatisfactory for higher ordered systems. However, the last two approaches offer a great deal of promise. (Markell-Cornell)
W72-00859

A WATER QUALITY PREDICTION MODEL AND A WATER QUALITY SIMULATION PROGRAM FOR THE WABASH RIVER,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05B.
W72-00860

COMPUTER ANALYSIS AND OPTIMIZATION OF A CLASS OF NON-LINEAR SYSTEMS,
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 07A.
W72-00862

6B. Evaluation Process

WATER RESOURCES PLANNING AND SOCIAL GOALS: CONCEPTUALIZATION TOWARD A NEW METHODOLOGY,
Utah State Univ., Logan. Utah Water Research Lab.
D. Peterson, H. Caulfield, R. d'Arge, D. Gorden, and M. Marts.
Available from the National Technical Information Service as PB-204 228, $3.00 for paper copy; $0.95 microfiche. Publication No. PRWG 94-1, Sep 1, 1971. 89 p, 9 fig, 8 tab, 24 ref, 4 append. OWRR C2194 (3383) (1).

Descriptors: *Planning, *Water policy, *Economics, *Social aspects, *Model studies, *Federal government, *Welfare (Economics), *Decision making, Environment, Intangible benefits, Conservation, Economic efficiency, Recreation, Social values, Water resources development, Aesthetics.
Identifiers: *Social indicators, *Social goals, *General welfare, Social well-being, Equality, Western regional directors.

A modeling concept relating water resource use to 'social goals' is proposed by an interdisciplinary group formed by the thirteen western state Water Resources Research Institutes. It consists of a heierarchical array of elements beginning at the top with nine general word-described goals, tentatively postulated as a comprehensive set describing general welfare, and successively delineated by expanding strata of sub-goal descriptors eventually connected to water resource policy action variables through social indicators. The conceptualization draws on various national social-goal statements, on historical Federal water resources policy including the recent work of the Water Resources Council on 'principles' and 'standards' and on philosophical, political, ecological, economic, demographic, operations research, and technological study and experience represented by the group and its associates. An outside panel review is included. Tentative consideration is given to use of the model in the context of field planning and of policy formulation. The researchers visualize that the conceptualizations may be made predicative by quantization or partial quantization of connectives between elements. The report covers the first phase of a proposed 3-year program of conceptualization, verification, testing and implementation.
W72-00796

REVISED OBJECTIVES FOR DESIGN OF URBAN STORMWATER SYSTEMS IN THE PUGET SOUND REGION,
Washington Univ., Seattle. Inst. of Forest Resources.
For primary bibliographic entry see Field 05G.
W72-00797

THE POLITICAL EVALUATION OF ALTERNATIVE METROPOLITAN WATER-RESOURCE PLANS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Douglas A. Haith.
Available from the National Technical Information Service as PB-204 237, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 31, July 1971. 188 p, 17 fig, 14 tab, 63 ref, 1 append. OWRR Project C-1640 (3151) (1).

Descriptors: *Decision making, *Evaluation, *Project feasibility, *Planning, Political aspects, Optimum development plans, Political contraints, Ssystems analysis.
Identifiers: Metropolitan water management.

A methodology was proposed to assist in the selection and ranking of politically feasible water resource planning alternatives. Metropolitan water resource management plans were usually prepared to satisfy a variety of noncomensurable objectives or goals. Because all of the separate objectives or goals included in each alternative plan often cannot be expressed in the same units, e.g. dollars, the particular alternative plan deemed most desirable was a political decision. Accordingly, methods for generating and ranking politically feasible alternatives aided in eliminating from more further detailed consideration those alternatives that were clearly politically non-optimal. Results illustrated that a probabilistic form of indifference analysis could be used to identify and quantify important goals and to define the trade-offs between these goals. The approach provided a means of incorporating a policy maker's preferences into a systems analyses of various water resources planning alternatives. The proposed procedures were seen as a screening process that identified (1) from a large number of possible planning objectives or goals, those that were politically relevant and (2) from a large set of alternative plans which might be technically and economically feasible, a smaller subset that was also politically feasible. (Veverka-Cornell)
W72-00852

WABASH RIVER BASIN COMPREHENSIVE STUDY CONFERENCE,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
F. E. Morr, S. T. Pyle, F. E. Musleh, M. C. Stout, and A. Cantsell.
Papers presented at the Wabash River Basin Comprehensive Study Conference, December 1970. Various paging, 2 fig, 1 tab. OWRR A-012-IND (2).

Descriptors: *Optimum development plans, *Watershed management, *Resource allocation, *Future planning (Projected), *Long range planning, *Water supply, Multiple-purpose projects, Water resources development, River basin development.
Identifiers: *Wabash River.

Four broad objectives in the management of water and land resources were discussed at the Wabash River Basin Conference. The objectives were to enhance national economic development, to enhance the quality of environment, to enhance social well-being, and to enhance regional development. The broad-scale, multi-faceted aspects of future water and land use management were emphasized. A description of the Water Resources Council and a review of its responsibilities was given. The method and purpose of reviewing river basin reports was described. The problems of lood control or prevention were mentioned and flood plain management suggested as the best solution along with channel modifications, and building of levees, dams and reservoirs. Water supply needs were considered and a multi-purpose water related project involving flood control, low flow augmentation and recreation recommended. The need for a balanced system of water resource laws and related policies and procedures and long-range planning was emphasized and an equitable method of cost allocation formulated. Agricultural land and water needs of the river basin as reported in the study were also examined and evaluated. Systems analyses techniques as applied to the study were described, evaluated and recommended. Finally, the ways in which the report could be used in the university community were explored. (Markell-Cornell)
W72-00858

ECONOMIC DEVELOPMENT OF AREAS CONTIGUOUS TO MULTIPURPOSE RESERVOIRS: THE KENTUCKY-TENNESSEE EXPERIENCE,
Kentucky Univ., Lexington. Water Resources Inst.
M. B. Hargrove.
Research Report No. 21, 1971. 207 p, 3 fig, 29 tab, 128 ref, 5 append. OWWR A-006-KY (10).

Descriptors: *Multiple-purpose reservoirs, *Kentucky, *Tennessee, Statistical models, Planning, Population.
Identifiers: *Economic growth, *Industrial development, Lake Cumberland (Kentucky), Calvert City (Tennessee), Control groups, Location features, Multi-program planning, Spatial distribution (Industrial), Employment patterns, Per capita income.

The economic growth and industrial development of areas continguous to multipurpose reservoirs was investigated. A theoretical analysis of location factors reveals that development promoted in the contiguous areas by the project is a function of both the characteristics of the project and the area. Linear statistical models were used to compare the amount of economic development of twenty existing project sites in Kentucky and Tennessee with paired control areas over the period 1940-1960. It was found that some projects promoted rapid growth and others seemingly had little effect. The causes of this wide developmental variation were determined by examining two sites, Calvert City and Lake Cumberland. A favorable combination of factors provided by the reservoir project and location features not influenced by the project must exist before rapid economic expansion can occur. This study indicates the need for a multi-program planning approach which maximizes developmental benefits to limited geographic areas. (Haugh-Wisconsin)
W72-00863

AN ECONOMIC ANALYSIS OF COMMUNITY WATER RESOURCE USE WITH RESPECT TO AREA DEVELOPMENT IN ALABAMA,
Auburn Univ., Ala. Dept. of Economics.
J. H. Baker.
Master's Thesis, June, 1970. 97 p, 7 fig, 19 tab, 65 ref, 1 append. OWRR B-012-ALA (3).

Descriptors: *Water resources development, *Water supply, Water resources, Planning, Control, Water users, Water utilization, Economics, Water rights, Alabama.
Identifiers: *Economic development.

Alabama's water resources were analyzed with respect to economic development in order to ascertain the characteristics of community water suppliers, identify water resource problem situations, and suggest ways to prevent or alleviate certain

water resource problems. Questionnaires responded to by 212 Alabama communities indicated that (1) community water suppliers were experiencing increasing difficulty in meeting the demands of industrial and domestic customers, (2) the quality of water supplied by Alabama municipalities was generally adequate, and was expected to remain so in the near future, (3) inadequate planning for growing water needs and uses has caused many communities to experience water problems, (4) insufficient funds have prevented many communities from solving their water problems, and (5) future economic development depends, in part, on these problems being solved. Analysis of the communities' responses led to the following recommendations: develop a state agency charged with controlling the state's water resources, pass legislation clearly defining priority rights of water users, decrease industry's influence in state water resource agencies, and provide for better educated local water officials. A sample questionnaire is provided and numerous tables elaborate the study's results. (Settle-Wisconsin)
W72-00868

PRESENT AND FUTURE INCOME AND EMPLOYMENT GENERATED BY THE ST. LAWRENCE SEAWAY,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
E. Schenker.
The Seaway Review, Vol 1, No 3, Autumn, 1970. 10 tab.

Descriptors: *St. Lawrence Seaway, *Economic impact, *Great Lakes region, *Direct benefits, *Indirect benefits, Employment, Income.
Identifiers: Multiplier analysis.

The St. Lawrence Seaway produces economic benefits in two ways, by reducing the cost of transporting its hinterland's comerce and by generating increased activity at Seaway ports. To estimate these benefits a multiplier analysis is applied. This approach utilizes estimates of $5 and $24 as the average direct income per ton produced from servicing bulk and general cargo, respectively, at the Great Lakes ports. These estimatess combined with the income multipliers, suggest that in 1968 Seaway shipping accounted for approximately $283,000,000 of primary income and, with the addition of the indirect income effect, for nearly $643,000,000 of total income for the Great Lakes states. This amount accounts for approximately one per cent of the total income of the six Great Lakes states. The employment generated by Seaway traffic is another measure of the Seaway's impact. The multiplier analysis suggests that Seaway cargo directly provided income for 37,700 families in the Great Lakes region. Adding the secondary employment effects produces a total of roughly 85,700 families employed because of the Seaway's existence. By 1980 the Seaway could by contributing as much as $900,000,000 regionally if it can maintain its competitive position. (Settle-Wisconsin)
W72-00869

MARINE ALGAE AS AN ECONOMIC RESOURCE,
California Univ., Santa Barbara; and Florida State Univ., Tallahassee.
W. Silverthorne, and P. E. Sorensen.
In: Preprints of the Marine Technology Society, 7th Annual Conference, p523-533, 1971. 1 tab, 28 ref.

Descriptors: *Aquatic algae, *Resources, *Economic evaluation, Foods, Forages, Fertilizers.
Identifiers: *Economic resource, *Aquaculture, Agar, Algin, Carrageenan, Medical applications.

The total market value of the world's current annual production of unprocessed seaweed is estimated to be $350 million. Its major uses are as luxury speciality foods of rather low food value in the Orient and as specialized colloids (agar, algin, and others), fodder and fertilizer supplements in industrial countries. Direct application of seaweed extracts in medicine and drug manufacture has been limited to its use as a culture medium, a laxative and a dental impression compound. More exotic drug applications are either hypothetical or inferior to other drugs in use. Thus, despite much speculation concerning the production of food and drugs from marine algae, evidence indicates that seaweed will continue to contribute marginally to human nutrition and medication. Furthermore, the large amounts of labor involved in present methods of cultivating marine algae and the small success in attempts at mechanization lead to the conclusion that substantial increases in the level of marine algal resource utilization are not likely. (Wade-Wisconsin)
W72-00870

AQUACULTURE IN LESS DEVELOPED NATIONS: SOME ECONOMIC CONSIDERATIONS,
Rhode Island Univ., Kingston.
J. M. Gates.
In: Preprints of the Marine Technology Society, 7th Annual Conference, p 579-583, 1971. 4 ref.

Descriptors: *Fish farming, *Fish management, *Economic evaluation, *Resource development.
Identifiers: *Aquaculture, Fish culture, International investment, Underdeveloped nations, Aquaculture research.

The benefits of fish culture development and potential impediments to development are discussed. With private international trade flows toward underdeveloped nations being mainly in higher priced superior fish culture products, increases in international investment cannot be expected to substantially alleviate hunger although they may contribute to foreign exchange earnings. It is suggested that hunger can only be alleviated with the development of low cost aquacultural products by a low wage indigenous labor force. Some problems arising from the development of such an industry and some roles for the public sector in solving them are discussed. Aquaculture supply increases must be limited so as not to outrun market demand while adequate use rights and credit institutions must be developed. Marketing problems can be reduced by better transportation, processing and storage systems. In countries where fish are the traditional source of protein a greater proportion of research should be devoted to aquaculture. The role of the public sector in funding this research is recognized but the possibility of increased private participation is suggested. (Wade-Wisconsin)
W72-00871

THE EFFECTS ON PERSONAL INCOME DISTRIBUTION OF NEW YORK STATE ADMINISTERED EXPENDITURES FOR OUTDOOR RECREATION,
Cornell Univ., Ithaca, N.Y.
L. A. Shabman.
Master's Thesis, January, 1970. 204 p, 48 tab, 7 append. OWRR B-014-NY (1).

Descriptors: *New York, *Recreation, *Expenditures, *Marginal utility, *Net income, *Marginal income, Taxes, State governments, Investment, Cost-benefit analysis, Welfare (Economics).
Identifiers: *Income distribution, *Personal income, *Benefits principle of taxes, *Net transfer payments, Equal opportunity.

This study quantifies the impact of New York State recreation expenditures in 1967 on the distribution of income in terms of net transfer payment effects and net income effects. The net transfer effects of government expenditures and taxes go from positive to negative as income increases. The upper income levels support the lower income levels. Adding welfare weights, based on the marginal utility of income, decreases the upper income groups' loss of welfare while the lower income groups realize a gain. This indicates a positive increase in total welfare. A cost-benefit analysis measures the effect of new capital investment on income distribution. Positive benefits (willingness to pay) are realized by all income classes except the upper one. In conclusion, there is a definite income redistribution as the lower income groups receive more than they pay for at the expense of the upper income groups. The use of welfare weights tends to increase total welfare. Other non-quantifiable aspects such as the quality of experience and the need for recreation are discussed. It is recommended that the government provide transportation for the poor to recreation areas and that more urban parks be created. (Haugh-Wisconsin)
W72-00873

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF SPORT AND COMMERCIAL FISHERIES SUBPROJECT,
Idaho Cooperative Fishery Unit, Moscow. Fish and Game Dept.
J. Mallet, and T. C. Bjornn.
University of Idaho, Water Resources Research Institute, May 1971. 31 p, 9 tab, 6 fig, 7 ref.

Descriptors: *Sport fishing, *Commercial fishing, *Fish management, *Economic efficiency, *Planning, Evaluation, Resource development, Benefits, Idaho, Aesthetics, Water values, Social values, River basins, Chinook salmon, Trout, Life cycles, Fisheries, Spawning, Fish, Dams.
Identifiers: *Salmon River, Snake River.

The Scenic Rivers Study Unit of the University of Idaho is establishing criteria to identify and estimate economic, aesthetic, social and other values for study rivers as a river-planning tactic. Sport and commercial fisheries along the 410-mile long Salmon and 49-mile long Snake Rivers consist of Chinook salmon, Steelhead trout and Sockeye salmon. Life cycles and fishing and spawning areas of these species are illustrated. The net annual economic value of anadromous fish is about 3 million dollars. Construction of dams caused the decline in abundance of Idaho salmon and Steelhead stocks. Artificial propagation could limit the detrimental effects of dams on these stocks. Tables show fish stream utilization, fish population and abundance surveys, and economic estimates. (See also W71-05704, W71-05703, and W72-00876) (Popkin-Arizona)
W72-00875

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF HISTORY SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research inst.
J. J. Peebles.
University of Idaho, Water Resources Research Institute, March 1971. 168 p, 3 tab, 16 fig, 70 ref.

Descriptors: *History, *Planning, *Evaluation, *Resource development, *Benefits, Idaho, Economic efficiency, Aesthetics, Water values, Social values, River basins, Model studies.
Identifiers: *Salmon River Basin.

The Scenic Rivers Study Unit of the University of Idaho is establishing criteria to identify and estimate economic, aesthetic, social and other values for study rivers. Objects include resource inventory; identification, description and quantification of river benefits; development of evaluation models; and presentation of alternatives for resource uses. The general history of the Salmon River basin is presented, as such information is desirable as other subprojects progressed. Major report sections include pre-white man; Lewis and Clark expedition, fur trader, missionary and miner; territorial status, statehood and counties; Indian wars; transportation, agriculture and permanent settlements; and forester and recreationist. The effect of water in the basin on its history is identified. (See also W71-05704, W71-05703 and W72-00875) (Popkin-Arizona)

W72-00876

REVIEW - WATER RESOURCES DEVELOPMENT,
California Univ., Berkeley.
For primary bibliographic entry see Field 08H.
W72-00968

PROJECT AQUARIUS - CONTROL OF RADIOISOTOPES AND SAFETY,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 08H.
W72-00970

AQUARIUS STUDY - ENGINEERING AND ECONOMIC CONSIDERATIONS,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 08H.
W72-00972

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A PROGRAM TO DETERMINE VARIOUS DIVERSION LOSSES,
Washington State Univ., Pullman. Water Research Center.
For primary bibliographic entry see Field 07C.
W72-00803

FINANCING MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS,
Department of Health, Education, and Welfare, Cincinnati, Ohio. Bureau of Solid Waste Management.
R. M. Clark, and R. O. Toftner.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 96, No SA4, p 885-892, 1970. 4 ref.

Descriptors: *Solid wastes, *Project planning, *Financing, *Loans, *Use rates, Taxes, Investment, City planning, Debt, Governments.
Identifiers: *Solid waste management, *General obligation bonds, *Revenue bonds, *User charges.

The effects of available municipal financing practices are analyzed with regard to the implementation, engineering design, and operation facilities of a solid waste management system. The advantages and disadvantages of the three most commonly used financing alternatives, general obligation bonds, revenue bonds, and pay-as-you-go systems, are discussed and compared. Generally, every governmental unit responsible for solid waste management should consider establishing an appropriate user charge. Any borrowing should be related to the service fee, have low interest rates and reserve requirements, and be self-liquidating. No specific approach is recommended over another. Each municipality should choose an effective financing plan which relates the quantity and timing of income and expenditures to the need for funds. (Haugh-Wisconsin)
W72-00864

THE EFFECTS ON PERSONAL INCOME DISTRIBUTION OF NEW YORK STATE ADMINISTERED EXPENDITURES FOR OUTDOOR RECREATION,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06B.
W72-00873

AN INVESTIGATION OF ALTERNATE WASTE MANAGEMENT POLICIES IN A RIVER BASIN,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W72-00913

SECTION 169: AMORTIZATION OF POLLUTION CONTROL FACILITIES.

1971 Internal Revenue Bulletin No. 24, at 15-33.

Descriptors: *Taxes, *Tax rate, *Treatment facilities, *Pollution abatement, Government finance, Federal government, Regulation, Administration, Administrative agencies, Administrative decisions, Water pollution, Air pollution, Water pollution control, Water pollution treatment, Environmental sanitation, Non-structural alternatives, Waste disposal, Waste treatment, State governments.

A new income tax regulation dealing with a section of the Internal Revenue Code is herein adopted, superseding previous regulation. Every person, at his election, shall be entitled to an amortization deduction for certified pollution control facilities over a 60 month period. Necessary definitions are provided, as are examples of computing the amortization deduction. A certified pollution control facility is defined as a treatment facility used to abate or control water pollution by removing or disposing of wastes and other pollutants, and which has been certified by appropriate state and federal authorities as complying with all applicable state and federal regulations. If the facility has a useful life of more than 15 years the amortizable basis shall hear the same ratio to that portion of the adjusted basis of such facility as 15 bears to the number of years of useful life. The amount of the deduction, effect on other deductions, and depreciation subsequent to discontinuance or revocation of amortization are explained. Various requirements of and methods for figuring the amortizable basis are set forth. (Robinson-Florida)
W72-01013

REVENUE RULING 70-186: EXEMPTION FROM TAX ON CORPORATIONS.
1970 Internal Revenue Bulletin No. 16, at 16-18.

Descriptors: *Taxes, *Recreation facilities, *Water quality control, *Public benefits, Government finance, Federal government, Non-structural alternatives, Regulation, Administration, Administrative agencies, Lakes, Water quality, Water pollution control, Water policy, Water resources, Water resources development, Water pollution treatment, Recreation, Tax rate, Administrative decisions.

A nonprofit organization formed to preserve and improve the water quality of a lake used extensively as a public recreational facility qualified for exemption under a section of the Internal Revenue Code. The section provides for the exemption from federal income tax of organizations organized and operated exclusively for charitable purposes. The organization's principal activity was to treat the waters, remove algae, and otherwise improve water conditions for recreational purposes. These facts are distinguishable from a situation whereby an organization uses its funds primarily to foster private interests, and any benefit to the general public is only incidental. Organizations must file an exemption application, however, in order to be recognized as exempt. (Robinson-Florida)
W72-01014

CERTAIN SALT WATER POLLUTION OF UNDERGROUND WATER SUPPLY IS AN INVOLUNTARY CONVERSION FOR PURPOSES OF SECTION 1033 OF THE INTERNAL REVENUE CODE OF 1954.
Revenue Ruling 66-334, 1966-2 Cumulative Bulletin 302.

Descriptors: *Tax rate, *Taxes, *Administrative decisions, *Brine disposal, Administration, Administrative agencies, Government finance, Federal governments, Oil, Oil wells, Oil wastes, Saline water, Salinity, Brines, Damages, Accidents, Water pollution, Pollutants, Water pollution sources, Water pollution effects, Legal aspects.

An oil company constructed an earthen pit on the taxpayer's land into which salt water was deposited. A fault in the underground structure of the pit allowed the salt water to escape, causing permanent damage to the water sand and contaminating the freshwater. Payment was received by the taxpayer for these damages. Section 1033 of the Internal Revenue Code provides that if property is involuntarily converted, and the taxpayer purchases other property similar or related in service or use to the property converted, the gain shall be recognized only to the extent that the amount realized upon the conversion exceeds the cost of replacement property. It is not necessary that the taxpayer satisfy the test if suddenness if the cause of destruction otherwise falls within the general concept of a casualty. The salt water pollution of the underground water resulted in its destruction within the meaning of the section and is an involuntary conversion for purposes of that section. (Robinson-Florida)
W72-01015

A STATE APPROACH TO EFFLUENT CHARGE,
For primary bibliographic entry see Field 05G.
W72-01119

6D. Water Demand

WATER RESOURCES OF SALT LAKE COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-00788

WATER USE IN SOUTH CAROLINA-1970.
South Carolina Water Resources Commission, Columbia.

South Carolina Water Resources Commission Report, March 1971. 114 p, 5 fig, 19 tab.

Descriptors: *Water resources development, *Water supply, *Water demand, *Future planning (Projected), *South Carolina, Groundwater, Surface waters, Water yeild, Water users, Hydrologic budget, Reviews, Hydrologic data, Watershed management, Industrial water, Municipal water, Domestic water.
Identifiers: *Water use inventory (S.C.).

This inventory provides information on current and projected demands for water use within the State of South Carolina. The water use data is separated into three categories: industries operating private water systems, industries purchasing water, and water provided through municipal systems. Industries purchasing water, and water provided through municipal systems. Industries operating private water systems are presently using 379 mgd, or 56 percent of the total water used in the State. The projected water use for this category by 1980 is about 526 mgd, a 39 percent increase over the 10-year period. Industries purchasing water are currently using 125 mgd or 41% of the total water produced by municipalities. It is projected that this category will be using 155 mgd by 1980, a 24% increase for the 10-year period. Water produced through municipal systems represents 44% of the total water produced. Municipalities have projected that their water use for 1980 will increase 61%, or an average daily usage of 480 mgd. However, after the deduction of water sold to industries, municipal use is 174 mgd, only 26% of the total water use in South Carolina. This use is considered to be domestic and commercial, and is expected to increase by 85% by 1980. The total water use for South Carolina is projected to increase 48% over the next 10-year period, resulting in an average daily use of 1,006 mgd by 1980. (Woodard-USGS)
W72-00791

AN ECONOMIC ANALYSIS OF COMMUNITY WATER RESOURCE USE WITH RESPECT TO AREA DEVELOPMENT IN ALABAMA,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-00868

LAND USE CONTROL PRINCIPLES APPLIED TO OFFSHORE COASTAL WATERS,
Maine Univ., Bangor. School of Law.
O. E. Delogu.
Kentucky Law Jounral, Vol 59, No 3, p 606-628, 1971. 56 ref.

Descriptors: *Land use, *Water zoning, *Scenic easements, *Use permits, Water utilization, Leases. Identifiers: *Coastal waters, Land use controls, Offshore zoning, Coastal water leasing, Water area controls, Watersheds.

The application of land use control principles to offshore coastal waters is proposed as a means of resolving the conflicting and many times destructive patterns of use now found. Offshore water is divided into the following four use categories: surface water areas, areas between the surface and the bed, bed areas, and areas below the bed. Regulatory schemes would be developed to maximize competing activities in offshore waters while minimizing harmful conflicts. Proposed control tools include (1) offshore zoning, (2) leasing of offshore waters by the appropriate states, (3) licensing of specific water areas to specific users, and (4) acquisition of easements which would protect the public interest at relatively low cost. Other water use control mechanisms mentioned are increased use of state taxing power, increased state proprietary holdings of coastal lands and waters, and forceful articulation of public policy and goals. It was emphasized that water area controls must be coordinated with existing and future land use controls. (Wade-Wisconsin)
W72-00872

6E. Water Law and Institutions

CRAWFORD V YEATTS (SALINE POLLUTION OF FARMLAND FROM OIL DRILLING).

395 S.W.2d 413-420 (Civ. App. Tex. 1965). 8 p.

Descriptors: *Texas, *Saline water intrusion, *Farms, *Water pollution sources, *Oil fields, Oil wastes, Legal aspects, Judicial decisions, State governments, State jurisdiction, Water pollution, Water pollution effects, Saline water, Wells, Oil wells, Oil industry, Water quality, Remedies, Damages, Water pollution effects, Relative rights, Water wells.

Plaintiff landowner sought to recover damages for permanent injuries to her farm from the actions of defendant oil lease owners. Defendants operated six oil wells on plaintiff's property. Salt water produced from these wells was deposited into an open pit. After about eleven years of such activity, certain sections of plaintiff's farm would no longer sustain vegetation, and plaintiff's fresh water well became polluted. Plaintiff contended that the damages were permanent in nature and resulted from the negligent disposal of salt water by defendants. Defendants contended that: the action was barred by the statute of limitations, the evidence was insufficient to support the verdict, and the damages awarded by the trial court were excessive. The Texas Court of Civil Appeals held that the statute of limitations had not started to run until plaintiff discovered the damage to her land and, therefore, the action was not barred. Furthermore, the court ruled that evidence as to both the cause of the damages and the amount of damages was sufficient to support the judgment for plaintiff. The court held that the trial court committed no error in its use of the word 'pollution' in instructing the jury, or in its failure to define that word. (Horwitz-Florida)
W72-00572

TRILLINGHAM V. ALASKA HOUSING AUTHORITY (POLLUTION OF PERCOLATING WATERS).
109 F. Supp. 924-925 (D. Alas. 1953). 2 p.

Descriptors: *Alaska, *Percolating water, *Water pollution sources, *Pollution abatement, Wells, Bacteria, Water pollution, Legal aspects, Remedies, Damages, State governments, State jurisdiction, Subsurface waters, Relative rights, Water supply, Water quality, Water law, Judicial decisions, Water wells.

Plaintiff landowner sought to enjoin defendant housing authority from polluting and diminishing his supply of percolating well water. Plaintiff also sought to recover damages. Defendant constructed and operated a housing project adjacent to plaintiff's land. Plaintiff contended that the diminution of oil water was caused by defendant's alteration of the surface of the adjoining land. Plaintiff alleged the contamination was due to the presence of coliform bacteria. Defendant moved to dismiss the complaint claiming plaintiff had failed to state a cause of action. The trial court dismissed the complaint. The District Court of Alaska, First Division, affirmed the dismissal. The court held that liability for the pollution of percolating waters is based upon a showing of negligence or intentional invasion of a right. Ruling plaintiff had not alleged negligence on the part of defendant, the court granted defendant's motion to dismiss. (Horwitz-Florida)
W72-00575

LANDERS V. EAST TEXAS SALT WATER DISPOSAL CO. (JOINDER OF POLLUTERS AS DEFENDANTS).
248 S.W.2d 731-736 (Tex. 1952).

Descriptors: *Texas, *Water pollution sources, *Oil wastes, *Remedies, *Adjudication procedure, Legal aspects, Judicial decisions, Water pollution, Water pollution control, Water pollution effects, Water quality, Pipes, Pipelines, Saline water, Salinity, Brines, Oil, Oil fields, Oil industry, Oily water, Damages.

Plaintiff landowner sued defendant oil company and defendant salt water disposal company, jointly and severally, for damages resulting from the escape of oil and salt water into his lake. Plaintiff also sought an injunction against further pollution by defendants. Both defendants had pipelines which leaked oil or salt water into the lake. The trial court rdered a severance of the two causes of action. Plaintiff refused to replead, and the action was dismissed. The Supreme Court of Texas held that where the tortious acts of two or more wrongdoers join to produce an indivisible injury, one that cannot be apportioned with reasonable certainty, all of the wrongdoers will be held jointly and severally liable. The court reversed and remanded for trial on grounds that there had been no misjoinder of parties or causes of action. (Robinson-Florida)
W72-00585

SYMPOSIUM ON WATER LAW AND ITS RELATIONSHIP TO THE ECONOMIC DEVELOPMENT OF MONTANA'S WATER RESOURCES,
Montana State Univ., Bozeman. Water Resources Research Center.
Helmer Holje.
Available from the National Technical Information Service as PB-204 112, $3.00 in paper copy, $0.95 in microfiche. Report no 19, June 1971. 101 p. A-999-Mont.

Descriptors: *Water law, Judicial decisions, *Legislation, *Water rights, Water resources development, Legal aspects, Public rights, Land use, *Water utilization, *Prior appropriation, *Beneficial use, Water allocation (Policy), Economics, Evaluation, Social aspects, Montana.

This symposium was designed to analyze and discuss Montana's water law relative to the development of its water and land resources. Particular problem areas that impede or create conflicts in the use and development of these resources were given special attention. The symposium provided a forum for frank and open discussion of these problem areas enabling the participants and guests to develop a common understanding which should lead to a more optimum development of the State's water and land resources. There were 28 people representing state and federal agencies, legislators university personnel and lay people as direct participants in the symposium. This report contains all of these presentations. In many cases the participants did not have prepared papers. Their comments were transcribed and prepared for inclusion in this report.
W72-00634

MONTANA WATER LAW PROBLEMS,
Montana State Univ., Bozeman. Water Resources Research Center.
Albert W. Stone.
Available from the National Technical Information Service as PB-204 113, $3.00 in paper copy, $0.95 in microfiche. Report no 20, 1971. 37 p. OWRR-A-031-MONT (2).

Descriptors: *Water law, *Water rights, *Adjudication procedure, *Prior appropriation, *Judicial decisions, Legal aspects, Public right, Administrative agencies, Montana, Water allocation (Policy).

This report contains three articles concerned with Montana's water law. The first article, 'Problems Arising Out of Montana's Law of Water Rights', presents a broad coverage of the basic water law doctrines and the related problems. The second, 'Are There Any Adjudicated Streams in Montana', deals with the specific problem of stream adjudication. The final article, 'The Long Count on Dempsey: No Final Decision on Water Right Adjudication', is a case study of a stream having fourteen lawsuits with eight of these reaching the Montana Supreme Court. There are no legal footnotes and the style of writing is of such a nature that the articles are easily understood by those unfamiliar with legal terminology. For those interested in the specific legal cases and the more technical aspects of these studies the original reports are found in the Montana Law Review, Vols. 27, 19 and 31 respectively. (Holje-Montana)
W72-00635

WATER, WATER EVERYWHERE---BUT-A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
Richard G. Sheridan.
Available from the National Technical Information Service as PB-204 115, $6.00 in paper copy, $0.95 in microfiche. Report No 9, June 1968. 285 p, 16 tab, 8 charts, append. OWRR B-004-MONT (3).

Descriptors: *Political aspects, *Administration, Water resources development, *Decision making, *Montana, *Management, Legal aspects, Social aspects, Political constraints, State governments, Institutions, Interstate.

This study describes the political-administrative environment in which natural resources decision-making takes place, surveys administrative theory pointing out desirable changes, recommends action in the light of theory, and points out the difficulties that will be encountered in effecting such changes. General problems of governmental management are treated. The federal principle is considered as a complicating political factor in government management of natural resources and the relative roles of the central governments and the states is explored historically as well as described as it now exists. Principles for improving water management within the federal arrangement are recommended.

Attention is also focused upon the political-administrative environment for natural resources decision-making in Montana. The physical, economic, and cultural orientation of Montana is described. Management arrangements in other states and theoretical concepts in the area of administration are examined. Based upon the observations of arrangements in other states and the theoretical construct recommendations are provided for improving Montana's water resources management and considers the probably political-administrative forces of opposition to such improvement. (Holje-Wyoming)
W72-00637

LANDERS V. EAST TEXAS SALT WATER DISPOSAL CO. (ESCAPE OF OIL AND SALT-WATER INTO LAKE).
242 S.W.2d 236-240 (Civ. App. Tex. 1951), rev'd, 248 S.W.2d 731 (Tex. 1952).

Descriptors: *Texas, *Water pollution sources, *Remedies, *Pipelines, *Saline water, *Oily water, Oil wastes, Legal aspects, Judicial decisions, Water law, Water pollution, Water pollution control, Water pollution effects, Water quality, Pipes, Salinity, Brines, Oil, Oil fields, Oil industry, Damages.
Identifiers: Constitutionality, Injunction (Prohibitory).

Plaintiff landowner sued defendant oil company and defendant salt water disposal company jointly and severally for damages resulting from the escape of oil and salt water into his lake. Plaintiff also sought an injunction against further pollution. Both defendants had pipelines which leaked oil or salt water into plaintiff's lake. The trial court ordered a severance of the two causes of action. Plaintiff refused to replead, and the action was dismissed. The Texas Court of Civil Appeals affired the lower court's decision and overruled plaintiff's motion for a rehearing. The court held that: (1) a tort-feasor is liable only for the injury caused by his own wrong and (2) an action at law for damages can not be jointly maintained against several defendants when each defendant acted independently and there was no concert or unity of design. The court ruled that a suit to enjoin further pollution could be jointly maintained against defendants, even though they acted independently without concert or unity of design. The court determined that plaintiff's inability to jointly sue defendants for damages did not result in an unconstitutional taking of property or a denial of due process. (Robinson-Florida)
W72-00658

RATZLAFF V. FRANZ FOODS OF ARKANSAS (VIOLATION OF CONTRACT NOT TO OVER-SATURATE CITY SEWER SYSTEM),

468 S.W.2d 239-242 (Ark. 1971).

Descriptors: *Arkansas, *Cities, *Contracts, *Sewage treatment, Land use, Land tenure, Water pollution, Water pollution sources, Wastes, Industrial wastes, Farms, Dairy industry, Poultry, Water users, Sewage, Treatment facilities, Discharge (Water), Streams, Legal aspects, Judicial decisions.

Plaintiff diary farmers sought damages from defendant, who operated a chicken processing and fertilizer plant, for its discharge of noxious wastes into a municipal sewer system, which in turn discharged the sewage into a creek upstream from plaintiffs' lands. Plaintiffs alleged that defendant had failed to perform its contract with the city to remove and eliminate certain wastes from its sewage so as to prevent over-saturation of the city's sewer system and harm to downstream landowners. The trial court sustained defendant's demurrer and dismissed the complaint. Upon appeal the Supreme Court of Arkansas reversed, holding: (1) as a general rule, one who creates a nuisance such as stream pollution is liable to lower riparian owners for direct, probable consequences thereof; (2) a user of a city sewer is clothed with immunity from liability once he lawfully deposits sewage with the city; (3) a party who normally owes no obligation to the public may nevertheless contract to assume an obligation of due care; and (4) from plaintiffs' allegations it does not logically follow that defendant in violation of his contract can wrest control of the city sewage facilities from the city while at the same time claiming immunity from liability. (Rees-Florida)
W72-00661

STATE V. DAIRYLAND POWER COOP (POWER OF ATTORNEY GENERAL TO ABATE PUBLIC NUISANCE IN OPERATION OF POWER PLANT).

Descriptors: *Wisconsin, *Powerplants, *Pollution abatement, *Legislation, Water pollution, Water pollution control, Electric power production, Administrative agencies, State governments, Regulation, Adjudication procedure, Effluents, Air pollution, Public health, Smoke, Chemical wastes, Land use, Investigation, Remedies, Judicial decisions, Legal aspects.

Plaintiff, Attorney General, sought to abate a public nuisance in the operation of defendant's power plant alleged to be polluting the environment. Defendant's demurrer was overruled. Upon appeal the Supreme Court of Wisconsin affirmed, holding that legislation authorizing the Attorney General to bring actions to abate public nuisances was not repealed by implication through the enactment of amendments conferring on the department of natural resources broad authority to control air and water pollution. Repeal by implication is not favored, and there was legislative intent evident to confirm the status of the legislation. Neither the doctrines of primary jurisdiction nor exhaustion of administrative remedies deprived the circuit court of jurisdiction to hear the merits of the matter, and the complaint was sufficient to constitute a cause of action. An abatement order issued by the department of natural resources was held not to be a prerequisite to bringing an abatement action by the Attorney General. (Rees-Florida)
W72-00662

CHILLISQUAQUE CREEK WATERSHED ASS'N V. SANITARY WATER BD. (ADMINISTRATIVE DISCRETION IN GRANTING PERMITS FOR WASTE DISCHARGES).
280 A.2d 132-135 (Pa. Commonwealth 1971).

Descriptors: *Pennsylvania, *Administrative decisions, *Water quality control, *Electric power production, Judicial decisions, Water law, Legal aspects, Administration, Administrative agencies, Regulation, Standards, Permits, Water quality, Water pollution, Water pollution control, Streams, Electric powerplants, Electric power, Utilities, Industrial wastes.

Plaintiff Chillisquaque Creek Watershed Association appealed a Sanitary Water Board decision to issue a permit to the intervening appellee to discharge industrial wastes from its proposed steam electric station into Chillisquaque Creek. Plaintiff contended that this was an abuse of discretion without first establishing specific water quality criteria for the creek, considering both quantity as well as quality. Plaintiff also contended that sufficient studies were not made of the proposed discharge. The Commonwealth Court of Pennsylvania dismissed the appeal, holding that courts must approve an administrative board's action when such action is based on competent evidence and does not constitute an abuse of discretion. The grant of the permit was thus justified. (Robinson-Florida)
W72-00704

A CHALLENGE FOR THE PRESIDENT,
J. Lear.
Saturday Review, September 4, 1971. p 47, 1 p.

Descriptors: *Sewage disposal, *Water pollution control, *Legislation, *Political aspects, Water pollution, Water quality control, Water pollution sources, Pollution abatement, Water pollution treatment, Waste disposal, Sewage treatment, Pollutants, Federal government, Environmental sanitation, Legal aspects, Land use, Soil disposal fields, Waste dumps, Wastes, Sewage effluents, Sanitary engineering.

Two national priorities set forth by Senator Edmund Muskie of Maine would insure in law that the best available scientific knowledge and technological skill be put to use to clean the country's waterways and keep them clean. The top priority fixed by the Senator's environmental subcommittee is the recycling of pollutants and the containment of land disposal of sewage to prevent water pollution. As a second priority, where soil conditions are not conducive to land disposal of sewage, a proposed bill by the Senator calls for the best available pollutant treatment before discharge into waters. The federal agency with the greatest experience in planning, the Corps of Engineers, would assist planning on a regional basis. Federal subsidies would be applied to sewage disposal facilities and acquisition of necessary land. If President Nixon opposes the bill, he may be faced with bi-partisan support for the bill. If we are to have clean waters and a high quality of life, Muskie's bill must be passed to insure adequate laws to achieve that goal. (Smiljanich-Florida)
W72-00707

RYAN V. PITKIN IRON CO. (VALIDITY OF PERMIT TO BUILD CAMPSITE AND SEWAGE DISPOSAL PLANT ON NATIONAL FOREST LANDS).
44 F.2d 717-719 (10th Cir. 1971).

Descriptors: *Colorado, *Sewage disposal, *National forests, *Camp sites, Mining, Forests, Public lands, Permits, Administrative agencies, Administrative decisions, Legal aspects, Judicial decisions, Remedies, Mineral industry, Cities, Water pollution sources, Water pollution control, Administration, Regulation, Federal government.

Plaintiff landowner sought to prevent defendant corporation from erecting a trailer camp and sewage disposal plant on national forest lands. Defendant intended to erect the camp on its unpatented millsite claim for its employees who worked in a mine several miles away. A permit for the facility had been obtained from the forest supervisor. Plaintiffs alleged: (1) the trailer camp and disposal plant were an improper use for the millsite claim under mining laws, (2) a sewage disposal plant is an improper use for national forest lands, and (3) the camp and disposal plant would be a nuisance. Since plaintiffs had not sought a Department of the Interior determination that the camp was an improper use, and an administrative appeal on the issuance of the permit was pending before the Secretary of Agriculture, the United States Court of Appeals, Tenth Circuit, held that plaintiff could not seek judicial relief under the exhaustion and primary administrative jurisdiction doctrines. Moreover, because the facilities were not completed or in use, the court held that injunctive relief against a merely threatened nuisance could not be obtained. Hence the trial court's dismissal of the action was affirmed. (Hart-Florida)
W72-00740

IN RE SINCERE NAVIGATION CO. (GOVERNMENTAL RECOVERY OF EXPENSES INCURRED IN INVESTIGATING WRECK TO DETERMINE IF NAVIGATIONAL HAZARD CREATED).
327 F. Supp. 1024-1027 (E.D. La. 1971).

Descriptors: *United States, *Navigation, *Accidents, *On-site investigations, *Navigable waters, Ships, Salvage value, Admiralty, Barriers, Reimbursable costs, Cost repayment, Damages, Remedies, Federal government, Regulation, Legal aspects, Legislation, Judicial decisions, Inspection.
Identifiers: *Navigational hazards.

Plaintiff United States sought to recover from defendant vessel owner expenses incurred in investigating a wreck. Plaintiff contended that defendant's vessel negligently collided with and sank plaintiff's vessel. Plaintiff incurred expenses in investigating the wreck to determine if an obstruction to navigation existed. Defendant contended that recovery could not be had by the government under applicable federal statutes unless both vessels were privately owned, and that recovery for investigation expenses was inappropriate where such investigation showed that no navigational hazard was created. On defendant's motion for summary judgment, the United States District Court, Eastern District of Louisiana, New Orleans Division, ordered that the federal government could recover expenses incurred in investigating the wreck if defendant were shown to be negligent. As owner of the vessel, the United States had the duty to take necessary action to remove any hazard to navigation. In its governmental capacity, it had the right to recover the cost of wreck removal from those who had negligently created the navigational obstruction. A necessary concomitant of this right is the right to investigate to determine if the wreck constitutes a navigational hazard. (Smiljanich-Florida)
W72-00741

GUTHRIE V. ALABAMA BY-PRODUCTS CO. (FEDERAL QUESTION JURISDICTION UNDER THE RIVERS AND HARBORS ACT).

328 F. Supp. 1140-1149 (N.D. Ala. 1971).

Descriptors: *Federal jurisdiction, *Rivers and Harbors Act, *Judicial decisions, *Pollution abatement, Legal aspects, Legislation, Federal government, Administrative agencies, Permits, Alabama, Remedies, Riparian rights, Rivers, Industry, Industrial wastes, Pollutants, Navigation, State governments, Water pollution, Water pollution control, Water quality, Water quality control.

Plaintiff riparian landowners sought damages and injujctions in federal district court against defendant upstream industrial corporations for pollution injury. Plaintiff sought to invoke both diversity jurisdiction and federal question jurisdiction under: (1) the Rivers and Harbors Act, (2) the Civil Rights Acts, and (3) the fifth and fourteenth amendments. The action was based on violation of the Rivers and Harbors Act, and Alabama common law theories of negligence, trespass, and nuisance. Defendants moved to dismiss for lack of jurisdiction. Since all plaintiffs were not from different states than defendants, the court held it possessed no diversity jurisdiction. Concerning federal question jurisdiction, the court held: (1) the Civil Rights Act protected personal liberties rather than property rights, and hence no federal question was raised under it, (2) the Alabama permits issued for the discharges was not 'state action' which raised a question under the fourteenth amendment; (3) the fifth amendment only applies to the federal government, and no federal action was alleged; and (4) the Rivers and Harbors Act did not contemplate standing for private citizens' suits, and, moreover, only prohibited pollution affecting navigation. Hence, the complaint was dismissed for lack of federal jurisdiction, and plaintiff was left to Alabama common law remedies. (Hart-Florida)
W72-00749

THE ECOLOGICAL CRISIS--MAN'S ULTIMATE CHALLENGE,
G. Nelson.
Congressional Record, Vol 116, No 16, p 51354-55 (daily ed February 7, 1970). 2 p.

Descriptors: *Environmental effects, *Water pollution control, *Pollution abatement, *Environmental sanitation, United States, Water pollution, Industrial wastes, Air pollution, Lakes, Ecology, Parks, Electric power industry, Mineral industry, Pollutants, State governments, Federal government, Legislation, Legal aspects.

Recognizing that the environmental crisis has reached dangerous proportions, Senator Nelson notes that this condition could be corrected, but not without significant modifications in our way of life. Our institutions must readjust their philosphical attitudes toward man's relationship to his environment and all living creatures. Nelson then inserted a speech by Senator Montoya into the Congressional Record. Montoya stated that pollution knows no boundaries. We all live downstream from someone. Examples are cited of the pollution of our lakes, air, and public parks. Its effects on vegetation and wildlife are noted. Partial responsibility lies with the President, auto makers, strip miners, and power producers. The citizenry should get angry over pollution and polluters, but the federal government must set an example and make examples of polluters. Although the Congress has taken steps in this direction, on the state level an entirely different sort of effort must be developed. Polluters must be penalized and punished. Real enforcement of federal laws is needed, as well as an aroused people demanding action by state legislatures. (Shelnut-Florida)
W72-00751

MARKET TRANSFERS OF WATER RIGHTS: TOWARD AN IMPROVED MARKET IN WATER RESOURCES,
National Water Commission, Arlington, Va.
Charles J. Meyers, and Richard A. Posner.
Available from National Technical Information Service, as PB-262 620. Cost $3.00 per copy, $0.95 microfiche. Legal Study No 4, NWC Report No L-71-009, July 1, 1971. 144 p.

Descriptors: *Economic efficiency, *Prior appropriation, *Unappropriated water, *Water transfer, Third part effects, Interbasin transfers, Legal aspects.

This study analyzes imperfections in law and institutions that interfere with market allocation of water resources. These imperfections include laws and policies that restrain transfers, institutional shortcomings that make determination of return flow costly, and the absence of property interests in the return flow generated by the new use. Legislative remedies are suggested in both substantive law and procedure. Mutual water companies are described as providing promise for promoting transfers. Application of the market system to interbasin transfers is considered. (Meyers-NWC)
W72-00752

LEGAL ASPECTS OF MAJOR INTERBASIN TRANSFERS,
National Water Commission, Arlington, Va.
R. W. Johnson.
Available from National Technical Information Service as PB-202 619. Cost $3.00 per copy, $0.95 microfiche. Legal Study No 7, NWC Report No L-71-008, July 21, 1971. 213 p.

Descriptors: *Federal jurisdiction, *Interstate compacts, *Water transfer, Environmental effects, State jurisdiction, Legal aspects.

This study investigates the legal and public policy aspects of major interbasin transfers of water. It contains recommendations for criteria to govern the authorization of interbasin projects. It considers interstate compacts as a tool for effecting such transfers. It describes various kinds of protection devices for the area of origin. It proposes a 'sales alternative' to typical protection devices. It recommends consideration of environmental impacts of transfers. (Meyers-NWC)
W72-00753

IMPROVEMENT OF STATE WATER RIGHT RECORDS,
National Water Commission, Arlington, Va.
R. L. Dewsnup, and C. J. Meyers.
Available from National Technical Information Service as PB-202 618, $3.00 per copy; $0.95 microfiche. Legal Study No 4A, NWC Report no L-71-007, July 1, 1971. 74 p.

Descriptors: *Water rights, *Water permits, *Water transfer, Prior appropriation, Prescriptive rights, Legal aspects.

This paper describes defects in existing laws relating to water rights. These defects arise from inadequate records. The records are inadequate for three reasons: (1) Some water rights are not on record; (2) Water rights on record are not accurately described; (3) Water rights on record have lapsed. Recommendations to cure these defects are made; legislation is set forth. A proposal to quantify return flow from irrigation is set forth. (Meyers-NWC)
W72-00754

FUNCTIONAL ANALYSIS OF APPROPRIATION LAW.
National Water Commission, Arlington, Va.
C. J. Meyers.
Available from National Technical Information Service, as PB-202 617, $3.00 per copy; $0.95 microfiche. Legal Study no 1, NWC Report No L-71-006.

Descriptors: *Appropriation, *Permits, *Reservation doctrine, *Water law, Economic efficiency, Investment.

The origin and basic elements of the appropriation system in water law are explained. The analysis shows the economic objectives of the system. Weaknesses of the judicially created system are considered. The emergence of the permit system is described. Parallels and contrasts with the riparian system are noted. The relationship of federal and state laws of water rights is explained. The reservation doctrine is treated. The monograph serves as an introduction to other Legal Studies conducted by the National Water Commission. (Meyers-NWC)
W72-00755

WATER POLLUTION,
Senate, Washington, D. C.
G. Allott.
Congressional Record, Vol 116, No 47, p 54465-67 (daily ed March 25, 1970). 3 p.

Descriptors: *Water pollution sources, *Water pollution control, *Accidents, *Oil, Water pollution, Water pollution effects, Water pollution treatment, Water quality, Water quality control, Pollutants, Pollution abatement, Disasters, Hazards, Safety, Pipelines, Oil wells, Oil fields, Oil industry, Ships.

Water pollution is a major concern of all Americans. A major potential source of water pollution is accidents in or around water. For example, the Santa Barbara oil spill was disastrous, but the Torrey Canyon tanker spill was 120 times larger. Nevertheless, the Torrey Canyon was not a major tanker by today's standards: modern tankers under construction could spill 2.7 million barrels of oil. The United States has not yet experienced an oil spill of major proportions. Smaller tankers, however, would undoubtedly create more congestion and opportunity for accidents. Maine is especially susceptible to oil spill disaster, because so many of its inhabitants earn their living from the sea. Furthermore, a great potential for accidental pollution exists in the interior United States. The nation is laced with various types of pipelines and many hazardous materials are transported on waterways. To combat the accidental pollution problem, we need to elicit public concern, direct research towards reducing accident probability and strictly enforce regulations. Moreover, we need new technology to remove pollutants when accidents do occur. Let us make activities on and around water a blessing rather than a threat to our coasts and waterways. (Hart-Florida)
W72-00790

INTRODUCTION OF A BILL TO ESTABLISH AN ENVIRONMENTAL QUALITY ADMINISTRATION,
H. Scott.
Congressional Record, Vol 116, No 14, p S 1156-7 (daily ed. February 4, 1970). 2 p.

Descriptors: *United States, *Environmental effects, *Administrative agencies, *Coordination, Water pollution, Water pollution control, Air pollution, Solid wastes, Water quality control, Administration, Waste disposal, Federal government, Treatment facilities, Legislation, Legal aspects, Water pollution sources, Administrative decisions, Water pollution treatment.

Senator Scott introduced legislation to consolidate and coordinate our basic national environmental quality efforts through the creation of an Environmental Quality Administration. Presently, there are at least ninety separate federal environmental quality programs. Twenty-six quasi-governmental units and fourteen interagency committees share in the responsibility for environmental efforts. Counter productive efforts are thus inevitable. This bill, however, would alleviate the problem by consolidating, under the Administration, existing programs in the three basic environmental quality areas. The Administration would have an air pollution control division, a water pollution control control division, and a division of solid waste disposal. This approach would attempt to create a functional agency within workable jurisdictional limits. Additionally, the bill would provide a clearinghouse function for the administration. Here, the Environmental Quality Administration would be responsible for compiling data, aiding applicants, and disseminating information concerning pollution control to other agencies. (Shelnut-Florida)
W72-00793

A BILL TO PROVIDE A NATIONAL COMMITMENT FOR FINANCING OF EXPANDED PROGRAMS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT,
Senate, Washington, D. C.
T. F. Eagleton.
Congressional Record, Vol. 117, No 31, p S 2641-44 (Daily ed March 9, 1971). 4 p, 1 tab.

Descriptors: *Water pollution control, *Government finance, *Sewage treatment, *Treatment facilities, *Federal government, Water pollution, Water quality, Water quality control, Pollution abatement, Cities, State governments, Financing, Costs, Grants, Capital supply, Water resources, Legal aspects, Sewage, Sewage disposal, Waste disposal, Waste treatment.
Identifiers: *Water Pollution Control Act.

In response to the water pollution control needs of cities, as stated by the National League of Cities and the U. S. Conference of Mayors, the Clean Water Commitment Act of 1971 would provide a national commitment for financing expanded programs under the Federal Water Pollution Control Act and assure better coordination in the development of clean water programs. Appropriations would be made for grants to assist states and interstate agencies in meeting the costs of establishing and maintaining adequate water pollution control and prevention. A firm commitment of $15,000,000,000 would be provided for the next five years. Criteria are established for determining the priority of state projects and limitations on federal grants. Seventy-five percent of such funds would be allocated among the states according to the ratio of each state's population to the national population. Remaining funds would be available to abate the most severe water pollution problems. State allocations may be increased by one-third if the state appropriates an amount equal to not less than one-third of the existing state allocation. The text of a background paper on improvements to the Federal Water Pollution Control Act is set forth. (Robinson-Florida)
W72-00804

FEDERAL WATER POLLUTION CONTROL ACT,
House of Representatives, Washington, D.C.
J. D. Dingell.
Congressional Record, Vol 117, No 42, p H 1966-72 (daily ed March 24, 1971). 7 p.

Descriptors: *Treatment facilities, *Grants, *Construction, *Water quality control, *Federal government, United States, Water pollution, Water pollution control, Legislation, Legal aspects, Standards, Government finance, Financing, Adjudication procedure, State governments, Administration, Administrative agencies.
Identifiers: *Water Pollution Control Act.

Congressman Dingell introduced legislation providing for a comprehensive revision of the Federal Water Pollution Control Act. The bill increases annual appropriations for administrative and enforcement grants to state and interstate water pollution control agencies. It also provides that such money be used to maintain water quality standards and other pollution-related activities. The bill extends waste treatment construction grants and water quality standards programs to all navigable waterways, while requiring that every state adopt water quality standards and an implementation plan within nine months. The bill also covers the following areas: (1) grants for the construction of treatment works; (2) grants for state water pollution control agencies; (3) water quality standards and implementation plans; (4) inspection, monitoring, and entry procedures; (5) emergency pollution control; (6) citizen suits; (7) employee protection against discharge or discrimination; and (8) deceptive advertising. (Shelnut-Florida)
W72-00811

INTRODUCTION OF CLEAN LAKES ACT OF 1970,
Senate, Washington, D. C.
W. F. Mondale.
Congressional Record, Vol 116, No 55, p S 5356-58 (daily ed April 8, 1970). 3 p.

Descriptors: *Lakes, *Water pollution control, *Water quality control, *Legislation, Political aspects, Financing, Federal government, State governments, Local governments, Jurisdiction, Administration, Water pollution, Pollution abatement, Water pollution sources, Water pollution effects, Waste disposal, Legal aspects, Water conservation, Research and Development, Grants, Project planning, Public health, Treatment facilities.
Identifiers: *Water Pollution Control Act.

Congressional adoption of the Water Quality Improvement Act conference report marked the culmination of a long struggle to strengthen the Federal Water Pollution Control Act. Further steps are needed, however, to protect our Nation's lakes. The Clean Lakes Act of 1970 provides a four-part plan to reclaim these waterways. First the bill authorizes an increase in federal grants available under the Water Pollution Control Act for treatment works located near or adjacent to a lake and which discharge treated wastes into the lake or tributory waters. An annual appropriation of $150,000,000 through 1975 would be authorized, with the federal government picking up 65% of project costs. Second, technical and financial assistance would be provided to states and municipalities in carrying out a comprehensive program of pollution control. The bill authorizes up to 80% federal grants for this program from a total appropriation of $900,000,000 over a four-year period. Third, states may receive the use of experienced federal water resource agents to carry out this program. Fourth, measures to enforce water quality standards for lakes are provided, including penalties and injunctive relief. To delay cleaning our lakes is to risk losing them. (Horwitz-Florida)
W72-00831

SIX BILLS TO IMPLEMENT THE PRESIDENT'S ENVIRONMENTAL PROGRAM,
House of Representatives, Washington, D. C.
D. G. Brotzman.
Congressional Record, Vol 116, No 22, p E 1122 (daily ed February 19, 1970). 1 p.

Descriptors: *Political aspects, *Legislation, *Water pollution control, *Water quality control, *Federal government, Project planning, Air pollution, Water pollution, Water pollution sources, Water pollution effects, Legal aspects, State governments, Local governments, Jurisdiction, Public health, Waste disposal, Research and development, Recreational facilities, Fuels, Chemical wastes, Multiple purpose, Institutional constraints, Clean Air Act.
Identifiers: *Water Pollution Control Act, *Land and Water Conservation Fund Act of 1965.

Six bills designed to greatly assist the Nation's effort to improve the quality of the environment are herein introduced. Three of the bills amend and improve the Water Pollution Control Act, one amends the Land and Water Conservation fund Act of 1965, one amends and extends the Clean Air Act, and one authorizes research into the problems of solid waste disposal. This legislation will establish stronger automobile emission standards and apply the standards to all new vehicles. One of the chief deficiencies in existing legislation is the enforcement of air and water pollution standards. Those violating tougher standards in the new legislation would be subject to fines of $10,000 per day. New enforcement provisions also provide for swift court action. Another important feature of this legislative package enables the Department of the Interior to convey surplus property to states and local governments for parks and other recreational purposes. This package is an excellent example of why the House needs a standing Committee on the Environment to consider environmental quality legislation. These six bills closely interlock, and yet they will reach the floor piecemeal and, conceivably, in conflicting forms. (Horwitz-Florida)
W72-00832

DETERGENT POLLUTION CONTROL ACT OF 1970,
House of Representatives, Washington, D. C.
R. C. Pucinski.
Congressional Record, Vol 116, No 31, p H 1459 (daily ed March 3, 1970). 1 p.

Descriptors: *Water pollution control, *Detergents, *Phosphates, *Legislation, Legal aspects, Federal government, Water pollution, Water pollution sources, Water pollution effects, Political aspects, Chemical wastes, Phosphorus, Project planning, Public health, Water quality, Water quality control, Financing, Standards, Research and development.

Phosphates, a basic ingredient in 90% of all detergents and household cleaning products, are being dumped into the Nation's lakes and streams at a fantastic rate. Recent studies indicate that detergent sources account for 70% of the phosphate inputs that compose municipal wastes, and such wastes are responsible for over 60% of the Nation's water pollution. Phosphates accelerate the eutrophication of receiving waters. This causes an increased growth of algae and other forms of unwanted living matter. To combat phosphate pollution, Rep. Pucinski's Bill would ban phosphorus in detergents by June 30, 1972, under enforcement of the Secretary of the Interior. The Pucinski Bill also provides the Secretary with the authority to establish standards of ability, biodegradability, toxicity, and of effects on the public health and welfare which must be met by all synthetic detergents. Financial assistance, amounting to $10,000,000 a year for the next five years, will be made available to accelerate the development and manufacture of near or nonpolluting detergents. This legislation is intended to combat a devastating pollutant of our water resources. If we refuse to act, we will have

destroyed a basic link in our ecological cycle. (Horwitz-Florida)
W72-00839

ENVIRONMENT IN DANGER OF COLLAPSE,
House of Representatives, Washington, D.C.
Hanna.
Congressional Record, Vol 116, No 15, p H 675-77 (daily ed. February 5, 1970). 3 p.

Descriptors: *Federal government, *Oil industry, *Drilling, *Offshore platforms, *Water pollution control, United States, Oil wastes, Oily water, Administrative agencies, Administration, Air pollution, Water pollution, Water pollution sources, Legislation, Legal aspects, Oceans, Environmental sanitation, Water quality, Leases.
Identifiers: *Santa Barbara Channel, Air Quality Act.

Alarmed about the possible collapse of the environment, Congressman Hanna of California introduced legislation furnishing a citizen with the ability to enforce in federal court his right to safe, healthful, productive, and esthetically and culturally pleasing surroundings. This recognizes the veracity of the assertion that a citizen's greatest civil right is his ability to due in a court of law. Additionally, he introduced a measure that would ban offshore oil drilling in the Santa Barbara Channel. The bill would require the Secretary of the Interior to withdraw all licenses and refund all fees or exchange present oil leases for others. Drilling would only be allowed to relieve the pressure that causes eruptions. The Congressman also introduced two amendments dealing with anti-emission standards to the Air Quality Act of 1967. The provisions of tese amendments are described. (Shelnut-Florida)
W72-00865

LAND USE CONTROL PRINCIPLES APPLIED TO OFFSHORE COASTAL WATERS,
Maine Univ., Bangor. School of Law.
For primary bibliographic entry see Field 06D.
W72-00872

WYOMING WATER LAW,
Wyoming State Engineer's Office, Cheyenne.
S. H. Ross.
Earth Science Bulletin, Vol 4, No 2, p 11-17, June 1971. 5 fig, 7 ref.

Descriptors: *Water law, *Water rights, *Wyoming, *Prior appropriation, *Water permits, Water transfer, Industrial water, Surface waters, Groundwater, Adjudication procedure, State jurisdiction.

A summary is presented of the laws and attendant regulations of water use as administered by the Wyoming State Engineer's Office. The stages preliminary to obtaining a water right are administered by the State Engineer's Office, but adjudications are handled through the State Board of Control, a separate but related water control agency. Almost all other states require adjudication through the courts, a much more expensive and complicated procedure. The first state water law, relating to surface water rights was enacted in 1885. There are 2 types of surface water rights, direct flow rights and storage rights. Groundwater legislation was not enacted until 1945. More recent amendments require permits before drilling commences, even for test holes. The steps involved in obtaining adjudicated surface water and groundwater rights are outlined. In addition to these, permits are also issued for temporary industrial water uses, obtainable from any adjudicated or valid unadjudicated water right. The duties of the State Engineer's Office and the other state agencies involved in water regulation are briefly listed. (Casey-Arizona)
W72-00874

WATER QUALITY STANDARDS,
J. S. Cooper.
Congressional Record, Vol 116, No 14, p S 1170-72 (daily ed. February 4, 1970). 3 p.

Descriptors: *United States, *Water pollution control, *Standards, *Operation and maintenance, Federal government, Water pollution, Water quality control, Air pollution, Clean Air Act, Administrative agencies, Administration, Government finance, Legislattion, Legal aspects, Water pollution sources.

Recognizing that the federal government has become one of the nation's worst polluters, the President of the United States issued an executive order requiring all projects or installations owned by or leased to the federal government to be designed, operated, and maintained so as to conform with present and future air and water quality standards established under federal legislation. The order provides that specific performance requirements for each facility will be set by agency heads, with the approval of the Secretary of Health, Education and Welfare in the case of air pollution controls and the Secretary of the Interior in the case of water pollution controls. All existing facilities must comply with this order by December 31, 1972. The order provides financing to achieve its objectives. It also requires all facilities which are built in the future to be pollution free. This order sets precise standards and provides for strict enforcement. Additionally, it guarantees that control funds will not be diverted to other uses and establishes procedures for operating pollution control facilities, handling materials which may cause pollution, and eliminating pollution of groundwaters. (Shelnut-Florida)
W72-00918

LEGISLATION TO AMEND THE REFUSE ACT FOR INDIVIDUAL CIVIL ACTS AGAINST WATER POLLUTERS,
United States House of Representatives.
M. J. Harrington.
Congressional Record, Vol 117, No 70, p E4342-44 (daily ed. May 13, 1971). 3 p.

Descriptors: *Remedies, *Water pollution control, *Public rights, *Rivers and Harbors Act, Political aspects, Legal aspects, Legislation, Damages, Judicial decisions, Pollution abatement, Water pollution, Water pollution sources, Public health, Waste disposal, Water conservation, Federal government, Jurisdiction.
Identifiers: *Refuse Act, *Qui tam action.

The Refuse Act is considered to be one of the most effective instruments presently available to citizens taking individual action against those who pollute waterways. Representative Harrington introduced legislation to amend the Refuse Act to make clear that qui tam suits may be used by citizens against polluters. Qui tam is an old legal principle that allows an individual to sue on his own behalf and on behalf of the government when the individual is entitled to a portion of any pecuniary penalty. This theory has not been allowed under the Refuse Act because federal judges have determined that the Act creates only criminal liability, not civil actions by informers. To remedy this situation three areas of change are proposed: (1) clearly separated monetary fines and criminal penalties, (2) specific authority for individuals to bring a qui tam suit if the U.S. Attorney does not act on the complaint within 90 days, and (3) an increase in fines with recoveries divided equally between the informer and the Environmental Protection Agency. Horwitz-Florida)
W72-00919

WATER POLLUTION,
M. J. Harrington.
117 Cong Rec 9227-9231 (daily ed August 6, 1971). 5 p.

Descriptors: *Financing, *Water pollution control, *Project planning, *Political aspects, Federal government, State governments, Jurisdiction, Administration, Administrative agencies, Standards, Water pollution, Legislation, Legal aspects, Water pollution sources, Treatment facilities, Local governments, Grants, Government finance, Participating funds, Remedies, Permits, Damages.

The present approach to water pollution control is fragmented and incapable of solving the nations problems. Congress is urged to adopt an overall plan to achieve the national goal of clean water. Several definite proposals are put forth to meet this goal. The Refuse Act of 1899 is deemed the clearest and most forceful water pollution abatement law in existance. Three bills are introduced to strengthen the Refuse Act. First, the scope of the Act would be broadened to include control over municipal and other public sewage treatment systems. Secondly, the responsibility for issuing permits to dump under the Refuse Act would be transferred from the Corps of Engineers to the Administrator of the Environmental Protection Agency. The third bill would specifically allow qui tam actions by citizens under the Refuse Act. Federal financing of pollution control facilities is then considered in detail. Major suggested changes include: (1) increasing appropriations to $5 billion a year, (2) full utilization of appropriated funds, (3) federal funding of 90% of project costs, and (4) aiding industry as well as local governments. (Horwitz-Florida)
W72-00973

WATERS--APPLICATION OF PESTICIDES.
For primary bibliographic entry see Field 05G.
W72-00995

TORT LIABILITY RESULTING FROM MINING OPERATIONS,
For primary bibliographic entry see Field 05G.
W72-00996

MARINE PROTECTION RESEARCH AND SANCTUARIES ACT NEEDED,
House of Representatives, Washington, D. C.
S. Gibbons.
117 Cong Rec 9360 (daily ed September 9, 1971). 1 p.

Descriptors: *United States, *Permits, *Waste disposal, *Environmental effects, Water pollution, Water pollution control, Federal government, Administrative agencies, Administration, Radioisotopes, Chemicals, Biological warfare, Dredging, Legislation, Legal aspects, Water pollution sources, Pollution abatement, Pollutants.

Congressman Sam Gibbons of Florida expressed his support for the proposed Marine Protection Research and Sanctuaries Act. This bill would prohibit the unregulated dumping of waste material into the oceans, coastal waters, and Great Lakes, and would specifically ban the transportation and dumping of radiological, chemical, or biological warfare agents and high-level radioactive wastes. The dumping of all other waste material would be prohibited unless authorized by a permit issued by the Environmental Protection Agency or the Corps of Engineers. The latter would be authorized to issue permits for dumping dredge and fill material only, provided those operations conform to criteria established by the Agency. At present, no standards exist regulating the dumping of waste into our coastal waters. This lack of adequate regulations is extremely detrimental to the ecology of our coastal waters. Regulation of indiscriminate dumping is needed, because our current practice of haphazard waste disposal has seriously damaged certain areas of our coastal zone and is on the verge of causing worldwide, irreversible environmental effects. (Shelnut-Florida)
W72-00997

ENVIRONMENTAL LAW ABSTRACTS, VOLUME 1,
A G C Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05G.
W72-00998

REMARKS BY U. K. ATTORNEY GENERAL ON 'TORREY CANYON' SETTLEMENT.
For primary bibliographic entry see Field 05G.
W72-00999

THE DEVELOPMENT OF BASIC WATER RESOURCE LAWS AND POLICIES IN RHODE ISLAND.
Water Resources Board, Providence, R. I.
For primary bibliographic entry see Field 05G.
W72-01001

THERMAL DISCHARGES: A LEGAL PROBLEM,
For primary bibliographic entry see Field 05G.
W72-01002

ENVIRONMENTAL LAW--CONSIDERATION MUST BE GIVEN TO ECOLOGICAL MATTERS IN FEDERAL AGENCY DECISIONS--ZABEL V.
For primary bibliographic entry see Field 05G.
W72-01003

POLLUTION OF FRESH WATER.
For primary bibliographic entry see Field 05G.
W72-01004

AGREEMENT CONCERNING POLLUTION OF THE NORTH SEA BY OIL.
For primary bibliographic entry see Field 05G.
W72-01005

INTERNATIONAL CONVENTION RELATING TO INTERVENTION ON THE HIGH SEAS IN CASES OF OIL POLLUTION CASUALTIES.
For primary bibliographic entry see Field 05G.
W72-01006

INTERNATIONAL CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION DAMAGE.
For primary bibliographic entry see Field 05G.
W72-01007

CANADIAN LEGISLATION ON ARCTIC POLLUTION AND TERRITORIAL SEA AND FISHING ZONES.
For primary bibliographic entry see Field 05G.
W72-01008

CANADIAN PRIME MINISTER'S REMARKS ON THE PROPOSED LEGISLATION.
For primary bibliographic entry see Field 05G.
W72-01009

WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-01010

WATER CONSERVATION AND THE PETROLEUM INDUSTRY,
Louisiana Stream Control Commission, Baton Rouge.
For primary bibliographic entry see Field 05G.
W72-01011

THE OIL INDUSTRY AND MULTIPLE USE OF THE COASTAL MARGIN,
Fulbright, Crooker, Freeman, Bates, and Jaworski, Houston, Tex.
For primary bibliographic entry see Field 05G.
W72-01012

ENVIRONMENTAL CONTROL PROBLEMS AND THE OIL INDUSTRY IN THE ROCKY MOUNTAIN REGION,
For primary bibliographic entry see Field 05G.
W72-01016

THE WATER DEGRADATION POLICY,
Glassie, Pewett, Beebe and Shanks, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01017

THE EXTERNALITIES OF A TORREY CANYON SITUATION; AN IMPETUS FOR CHANGE IN LEGISLATION,
McCarty and Noone, Washington, D. C.
For primary bibliographic entry see Field 05G.
W72-01018

INTERNATIONAL LAW AND MARINE POLLUTION: RADIOACTIVE WASTE AND 'OTHER HAZARDOUS SUBSTANCES',
University Coll., London (England).
For primary bibliographic entry see Field 05B.
W72-01019

ECOLOGY, ENVIRONMENT, INSURANCE AND THE LAW,
For primary bibliographic entry see Field 05G.
W72-01020

WATER QUALITY CONTROL IN CALIFORNIA: CITIZEN PARTICIPATION IN THE ADMINISTRATIVE PROCESS,
For primary bibliographic entry see Field 05G.
W72-01021

PUBLIC POLICY ON OIL - AN ECOLOGICAL PERSPECTIVE,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01022

ENVIRONMENTAL PROBLEMS OF THE OCEANS: THE NEED FOR INTERNATIONAL CONTROL,
Supreme Court, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01023

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
For primary bibliographic entry see Field 05G.
W72-01024

AN ENVIRONMENTAL PROGRAM FOR AMERICA,
Senate, Washington, D. C.
For primary bibliographic entry see Field 05G.
W72-01025

PUBLIC LAND POLICY AND THE ENVIRONMENT, VOLUME 2, PART II ENVIRONMENTAL PROBLEMS ON THE PUBLIC LANDS. SUMMARY STATEMENT AND CASE STUDIES 1 THROUGH 8,
Rocky Mountain Center on Environment, Denver, Colo.
For primary bibliographic entry see Field 05G.
W72-01026

INTERGOVERNMENTAL RELATIONS IN THE CONTROL OF WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-01028

AN ECOLOGICAL PERSPECTIVE FOR ARKANSAS,
Arkansas Univ., Fayetteville. School of Law.
For primary bibliographic entry see Field 05G.
W72-01029

SOLID WASTE MANAGEMENT.
For primary bibliographic entry see Field 05G.
W72-01030

AN INTERNATIONAL CONVENTION ON ENVIRONMENT COOPERATION AMONG NATIONS: PROPOSED DRAFT, POLICIES AND GOALS,
Oslo Univ. (Norway). Faculty of Law.
For primary bibliographic entry see Field 05G.
W72-01031

COMMON LAW REMEDIES AND PROTECTION OF THE ENVIRONMENT,
Tulane Univ., New Orleans, La. School of Law.
For primary bibliographic entry see Field 05G.
W72-01032

WATER POLLUTION: CONSERVATIONISTS CRITICIZE NEW PERMIT PROGRAM,
For primary bibliographic entry see Field 05G.
W72-01033

BRINGING POLLUTERS TO JUSTICE,
For primary bibliographic entry see Field 05G.
W72-01034

A NEW 'ASSERTION OF RIGHTS',
For primary bibliographic entry see Field 05G.
W72-01035

POLLUTION OF THE SEA BY OIL,
For primary bibliographic entry see Field 05G.
W72-01036

COMMENTS OF SIERRA CLUB ON PROPOSED PERMIT FORM TO BE USED BY THE CORPS OF ENGINEERS FOR DISCHARGE OR DEPOSIT INTO NAVIGABLE WATERS.
Sierra Club, San Francisco, Calif.
For primary bibliographic entry see Field 05G.
W72-01037

TENNESSEE WATER QUALITY CONTROL ACT OF 1971.

Tennessee Laws 1971, Public Acts, Ch. 164, as amended, Ch. 386.

Descriptors: *Tennessee, *Water quality control, *Administrative agencies, *Water pollution control, Water pollution sources, Water pollution, Water pollution treatment, Pollutants, Pollution abatement, Standards, Regulation, Legislation, Legal aspects, Remedies, Permits, Administrative decisions, Damages, Financing, Government finance, Federal government, Non-structural alternatives, State governments.

In order to control water pollution, Tennessee has enacted the Water Quality Control Act of 1971, which recognizes the public trust doctrine. After defining fourteen terms, the Act creates a Water Quality Control Board of seven members with staggered terms. The Board meets twice annually. The Board may adopt quality standards, make regulations, adopt a state water quality plan, and hear appeals from orders or permit denials of the Commissioner. The Commissioner of the Department of Health has comprehensive administrative powers. Permits are required for all discharges. Temporary permits may be issued. Orders may be issued by the Commissioner to prevent violations of the Act or regulations. The Act contains procedures for hearings before the Commissioner and appeals to the Board. The Act also renders a refusal to provide information requested under the Act unlawful. Violation of the Act is a misdemeanor, punishable by fine. The Commissioner may assess the liability of any polluter or violator for damages to the state, injunctive relief may also be sought. The Act also contains a citizen's suit provision. Funds appropriated for water quality control are earmarked for that use. The Act is to be liberally construed. (Hart-Florida)
W72-01038

POLLUTION OF WATERS OF STATE BY OIL.
Connecticut General Stat. Ann. secs. 25-5466 thru 25-54hh (Supp 1971).

Descriptors: *Connecticut, *Oil, *Water pollution control, *Administrative agencies, State governments, Water pollution, Water pollution sources, Water pollution effects, Water quality, Water quality control, Pollutants, Oil industry, Pollution abatement, Regulation, Legislation, Legal aspects, Remedies, Permits, Damages.

'Oil' is herein defined as floating oil of any kind, including fuel oil, sludge, oil refuse, and oil mixed with other matter. The Act directs the Connecticut Water Resources Commission to contain and remove oil spills and determine who is responsible for the spill. The Commission shall aso license, regulate, and inspect petroleum transfer facilities. The operation of transfer facilities without a license is punishable by fine. Vessels causing discharge of oil or other pollutants are required to report the incident to the state police and the Coast Guard. A failure to report such incidents is punishable by fine. Strict liability for pollution is imposed by the Act. The clean-up costs constitute the damages. Persons cleaning up pollutants are entitled to reimbursement for their reasonable costs by the polluter. 'Good Samaritans' will not be held liable for ordinary negligence when cleaning up pollutants at the request of an authorized state officer. The Commission represents the State in the coordination of activities with other agencies. It may contract for services. Permits are required to engage in the business of chemical or petroleum waste disposal, and the Commission shall render technical advice to such businesses. (Hart-Florida)
W72-01039

POWER PLANT SITING.
Maryland Laws, Ch 31, 1971.

Descriptors: *Maryland, *Water pollution control, *Electric power industry, *Electric power production, Government finance, Administrative agencies, Administrative decisions, Regulation, Transmission lines, Water resources, Electric powerplants, Powerplants, Legislation, Legal aspects, State governments, Environmental sanitation, Water pollution, Water quality, Water quality control, Electric power, Electric wires, Electric power rates, Sites.

An Environmental Trust Fund is established by the imposition of a surcharge on each kilowatt hour of electric power generated in Maryland. Details of a Power Plant Environmental Research Program are set forth. Provision is made for long-range power plant site evaluation. The Secreatry of Natural Resources shall acquire power plant sites to satisfy expected power requirements, and the methods by which is to be done are explained. Provision is made for judicial review of agency decisions and for an administrative staff to implement this Act. Permits for and registration of certain types of equipment are required. Appropriation of waters without consent of the Department of Natural Resources is unlawful. Requirements for the construction of generating stations or overhead transmission lines in excess of 69,000 volts are set forth, as are provisions for public hearings, long-range plans, and established rates of charges. (Robinson-Florida)
W72-01040

AUTHORITY OF CABINET TO DENY OIL DRILLING PERMITS,
A. C. Canaday.
1971 Florida Attorney General Reports, 071-183, July 6, 1971.

Descriptors: *Florida, *Permits, *Oil wells, *Drilling, Oil industry, Administration, Jurisdiction, Standards, Legislation, Judicial decisions, Legal aspects, Water pollution, Water pollution control, Water pollution sources, Saline water, Oil fields, Sheet flow, Supervisory control (Power), Administrative decisions, Administrative agencies, State jurisdiction.
Identifiers: Big Cypress Swamp.

Florida's governor requested the legal opinion of the Florida Attorney General as to the authority of the Cabinet sitting as the head of the Department of Natural Resources to deny oil drilling permits in the Big Cypress Swamp on the basis of damage to the ecology resulting from the necessary development concomitant with drilling operations. The Governor also asked whether the Cabinet would approve such permits with restrictions promoting statutory purposes. The Attorney General concluded that the Department does have authority to deny an application to drill for oil and to promulgate standards for site preparation to guard against oil or salt water pollution of fresh water. The statutory rule is that any denial of a drilling permit must be for just and lawful cause. In accordance with these rules, the Department would have authority to issue a permit with restrictions imposed to meet statutory standards. No statutory authority exists, however, for the denial of a drilling permit based solely upon a finding that drilling or site preparation would alter the sheet flow of water in that area. If state interests are damaged by such construction, other legal remedies must be utilized. (Shelnut-Florida)
W72-01041

PRINCIPLES OF RESPONSIBILITY IN THE UNITED STATES AND THEIR IMPLICATIONS FOR INTERNATIONAL ORGANIZATIONS,
Iowa University, Iowa City. School of Law.
For primary bibliographic entry see Field 05G.
W72-01042

THE INTERNATIONAL JOINT COMMISSION (U.S.-CANADA),
For primary bibliographic entry see Field 05G.
W72-01043

THE ROLE OF THE UNITED NATIONS IN CURBING OCEAN POLLUTION,
For primary bibliographic entry see Field 05G.
W72-01044

INTERNATIONAL AND NATIONAL REGULATION OF POLLUTION FROM OFFSHORE OIL PRODUCTION,
For primary bibliographic entry see Field 05G.
W72-01045

NEW OCEAN DEVELOPMENTS - - THE NIXON PROPOSAL OF MAY 1970,
For primary bibliographic entry see Field 05G.
W72-01046

THERMAL EFFECTS OF ELECTRIC PRODUCTION,
For primary bibliographic entry see Field 05G.
W72-01047

INTERNATIONAL CONTROLS OVER RADIOACTIVE WASTE DISPOSAL,
Columbia, Univ., New York.
For primary bibliographic entry see Field 05G.
W72-01048

ENFORCEMENT ACTIONS BY FEDERAL AGENCIES, INTERSTATE COMMISSIONS AND PRIVATE CITIZENS,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01049

ENFORCEMENT NOW,
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 05G.
W72-01050

THE ROLE OF PRIVATE ACTIONS IN POLLUTION ABATEMENT,
For primary bibliographic entry see Field 05G.
W72-01051

THE QUEST FOR ENVIRONMENTAL QUALITY: FEDERAL AND STATE ACTION, 1969-70.
Advisory Commission on Intergovernmental Relations, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01052

POLLUTION: WILL MAN SUCCEED IN DESTROYING HIMSELF.

Congressional Quarterly Weekly Report, Vol. 28, p. 279-285, January 30, 1970. 7 p, 1 fig.

Descriptors: *United States, *Legislation, *Political aspects, *Water pollution control, Federal government, Legal aspects, Regulation, Water law, Administrative agencies, Social aspects, Conservation, Treatment facilities, Pollution abatement, Non-structural alternatives, State governments, Public rights, Environment, Decision making, Planning, Attitudes, Human population.

The emergence of the environmental crisis and the congressional response to it, especially in 1969 are discussed. Consideration is also given to the protection of the environment as a political issue and the changes taking place in the conservation movement. Although President Nixon proposed a comprehensive pollution control program, the Democrats took the lead in introducing antipollution legislation. The environment also became an issue at the state level. Many of the established conservation organizations has taken a more active stance on pollution but they still faced such problems as the increased need for expertise as participants in decision-making hearings. The environmental lawsuit was being utilized both to prevent specific encroachments on the environment and to apply pressure on the executive and legislative branches of government. The most significant environmental legislation produced during 1969 was the National Environmental Policy Act which made environmental protection a national policy. Despite favorable legislation in such areas as waste treatment appropriations, Congress was unable to complete action on a major water pollution control bill. Still it was clear that the environment had become one of the major political issues of the year. (Johnson-Florida)
W72-01053

INTRODUCTION OF A BILL RELATING TO PENALTIES FOR OBSTRUCTION OF NAVIGABLE WATERS,
Senate, Washington, D.C.
T. Stevens.
117 Congressional Record 985 (daily ed. February 8, 1971). 1 p.

Descriptors: *United States, *Chemical wastes, *Rivers and Harbors Act, *Water pollution control, Water pollution, Remedies, Legislation, Legal aspects, Federal government, Federal jurisdiction, Non-structural alternatives.

Legislation has been introduced into the United States Senate to increase the penalties for violations of the Refuse Act of 1899. The maximum penalty would be raised from two thousand dollars to one hundred thousand dollars. Repeated infractions would be treated as separate violations each day they continue. The Act also penalizes chemical abuse of the Nation's waterways. With the current maximum penalty, the Refuse Act is ineffective against large-scale violators who find it profitable to break the law when penalties are small. (Shelnut-Florida)
W72-01054

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FOR ITS UNIFORM APPLICATION TO ALL OF THE NAVIGABLE WATERS OF THE UNITED STATES.
House Bill 7982, 92d Cong, 1st Sess. (1971). 48 p.

Descriptors: *Water quality control, *Pollution abatement, *Federal government, *Regulation, Water pollution, Water pollution control, Water quality, Standards, Financing, Treatment facilities, Planning, Future planning (Projected), Grants, Legal aspects, Legislation, Allotments, Interstate, State governments, Administrative agencies, Public rights, Remedies, Employment, Industries.

Appropriations are authroized for state and interstate water pollution control agencies in the sum of 30 million per year through 1976. The Administrator of the Environmental Protection Agency is authorized to make grants to agencies having effective plans to assist in the implementation and effective enforcement of water quality standards and pollution control laws. Each agency must adopt an approved plan for the enhancement of water quality which conforms with the specific requirements of the bill. If the Administrator, after giving notice and a hearing, finds that a plan does not conform, no further payments will be made. Appropriations are also authorized for construction of treatment works. Other provisions specify: (1) appeal procedure; (2) standards for allocating funds among the state and interstate agencies; (3) water quality standards and implementation plans; (4) federal enforcement of plans for the implementation, maintenance, and enforcement of water quality standards; (5) emergency pollution control measures; (6) citizen's suits; (7) employee protection against discharge or discrimination; and (8) deceptive advertising by manufacturers. (Gallagher-Florida)
W72-01055

A REGULATION RELATING TO WATER QUALITY STANDARDS FOR INTERSTATE AND COASTAL WATERS OF THE STATE OF WASHINGTON AND A PLAN FOR IMPLEMENTATION AND ENFORCEMENT OF SUCH STANDARDS.
For primary bibliographic entry see Field 05G.
W72-01059

GEORGIA IS POLLUTED - THE RAW FACTS AND WHY - PART I.
For primary bibliographic entry see Field 05G.
W72-01060

MISSISSIPPI AIR AND WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 05G.
W72-01061

REGULATION OVER SITING AND DESIGN OF POWER PLANTS,
Indiana Univ., Indianapolis. School of Law.
A. D. Tarlock.
In: Proceedings of the Conference on International and Interstate Regulation of Water Pollution, March 12-13, 1970, Columbia University School of Law, New York, New York, p. 201-206. 6 p.

Descriptors: *Electric power production, *Water quality control, *Thermal pollution, *Nuclear powerplants, Electrical engineering, Electrical design, Electric power, Electric power industry, Electric powerplants, Water quality, Water pollution, Water pollution control, Water pollution sources, Environmental sanitation, Pollutants, Water law, Legal aspects, Legislation, Regulation, Standards, Permits, Federal government, State governments, Thermal powerplants, Thermal power.

Two methods of controlling thermal pollution are the bringing of an abatement proceeding after the plant is in operation and regulation of site selection and construction. It is unlikely that any large powerplant will be enjoined in its operation; more consideration is therefore being given to regulation before operation begins. This involves environmental licensing and thermal water quality standards. The problem in environmental licensing is finding state or federal agencies with the capability and inclination to engage in environmental licensing. The effects of the National Environmental Policy Act of 1969 and the Water Quality Improvement Act of 1970 on environmental licensing and the implementation of thermal water quality standards are examined. Examples of various state approaches to environmental licensing are discussed. The Water Pollution Control Act of 1970 and recent legislation will advance environmental licensing and the establishment of thermal water quality standards. (Robinson-Florida)
W72-01062

RULES AND REGULATIONS GOVERNING THE OPERATION OF WATER POLLUTION CONTROL FACILITIES.
Oklahoma State Dept. of Health, Oklahoma City.
For primary bibliographic entry see Field 05G.
W72-01063

POLLUTION SPILLS AND BY-PASSES.
Kansas State Board of Health, Topeka.

Regulation No. 28-16-27, May 1969. 1 p.

Descriptors: *Kansas, *Sewage disposal, *Treatment facilities, *Waste storage, *Water pollution control, Water pollution, Water quality control, Regulation, Legislation, Legal aspects, Administrative agencies, Administration, Permits, State governments, Storage tanks, Supervisory control (Power), Adoption of practices, Sewage treatment.

The person responsible for a sewage discharge detrimental to water quality, under conditions other than provided for by a valid permit issued by the State Board of Health, shall report such discharge to the State Department of Helath, Environmental Health Services. When sewage treatment facilities are programmed for bypassing for cause, resulting in reduced treatment efficiency below acceptable levels, the owner shall notify and receive approval from the Department at least seven days prior to such discharge. Emergency or accidental sewage discharges shall be immediately reported to the Department by the owner of the treatment plant. In the event a water pollution causing material is in transit or in storage within Kansas, it shall be the responsibility of the owner, carrier, or person responsible for storage to immediately notify the Department that a pollutant has gained admittance or that there is the potential the pollutant will gain admittance to the waters of Kansas. (Shelnut-Florida)
W72-01064

LEGAL ASPECTS: PRIVATE REMEDIES FOR WATER POLLUTION,
Washington Water Research Center, Pullman.
J. Kamel.
May 1971. 15 p. 12 ref.

Descriptors: *Remedies, *Adjudication procedure, *Water pollution control, *Water quality control, *Non-structural alternatives, Riparian rights, Damages, Legislation, Legal aspects, Riparian waters, Competing uses, Riparian land, Water law, Navigable waters, Pollution abatement, Waste water (Pollution), Relative rights, Water rights, Washington.

An outline of the riparian system, a survey of some common aspects of water law, a description of the forms and present status of pollution remedies, and a discussion of possible remedial legislation are contained in this paper. Since society's attmept to deal legally with water pollution has not been entirely successful, a new approach to water quality management has been suggested. Such an approach would permit private parties to bring an action for damages or the abatement of water pollution through the mechanism of owning a transferrable right to discharge in a given region, subject to a water quality constraint at the region's boundaries. The right would be based on property lines and focus on external water quality boundaries. Quality standard violations at such boundaries would constitute prima facie evidence. Strict liability would be imposed. Such a system has the advantage of defining where agency monitoring should be located. Since legislation must be tailored to the water rights system existing in each state, suggestions concerning parties, evidence, and the sale of rights are discussed. The proposed system offers a mechanism for private intersts to express water-quality preferences, but the government is not released from water quality responsibility. (Shelnut-Florida)
W72-01065

SOME WATER QUALITY MANAGEMENT ASPECTS IN CALIFORNIA WATER RESOURCES DEVELOPMENT,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05G.
W72-01066

NATIONAL RURAL ENVIRONMENTAL ASSISTANCE PROGRAM FOR 1971 AND SUBSEQUENT YEARS.
Agricultural Stabilization and Conservation Service, Washington, D.C.

Federal Register, Vol. 36, No. 177, p. 18289-18298 (September 1971). 10 p, 2 tab.

Descriptors: *United States, *Soil conservation, *Land use, *Government finance, Cost sharing, Administration, Administrative agencies, Water conservation, Wildlife conservation, Adoption of practices, Coordination, State governments, Local governments, Financing, Federal government, Natural resources, Land resources, Water pollution, Water pollution control.

Through the rural environmental assistance program administered by the Department of Agriculture, the federal government will share with farmers and ranchers the cost of carrying out approved soil and water conservation practices, including related wildlife conservation and pollution abatement programs. The program's objectives are to: (1) prevent or abate agriculture-related pollution; (2) reduce the loss of agricultural soil, water, and related resources and assure their efficient multipurpose use; (3) encourage enduring conservation practices in sound land use systems; and (4) achieve goals consistent with community and national needs. Funds will be distributed among the states on the basis of conservation needs and then allocated among the state's counties. Procedures are established for development of state and county rural environmental assistance programs. Upon a farmer's request for assistance, the county committee with the assistance of state or federal agencies shall allocate funds for cost sharing to those practices deemed most essential. Requirements for completion of approved practices are detailed. Provisions relating to cost-sharing are specified. Conservation practices relating to protective and vegetative cover, wildlife, and disposal of woodland and crops for state and county programs are enumerated. (Shelnut-Florida)
W72-01067

THE 1899 REFUSE ACT SHOULD BE ADMINISTERED BY ENVIRONMENTAL PROTECTION AGENCY,
House of Representatives, Washington, D.C.
E. I. Koch.
117 Cong. Rec. 519 (daily ed. February 8, 1971). 1 p.

Descriptors: *United States, *Permits, *Standards, *Water pollution control, Water pollution, Water quality control, Waste disposal, Federal government, State governments, Channels, Legislation, Legal aspects, Administrative agencies, Administration, Environmental effects, Regulation, Wastes.

Legislation has been introduced into the United States Congress to amend the Refuse Act of 1899, which requires industries to obtain a federal permit for the discharge of any waste materials into the nation's navigable waterways. The Army Corps of Engineers is currently empowered to issue these permits. Because the Corps has historically exhibited little concern for natural resources, this bill would take this authority away from the Corps and give it to the newly formed Environmental Protection Agency. This is a logical and necessary amendment, since the Act today is considered a law to protect a part of our environment, not simply a law to insure navigational access. Additionally, the amendment would restore the independent authority granted by the Act in determining what is an allowable discharge, and transfer this responsibility to the Agency. The Act's original broad authority could be transferred without change to the Agency, effectively giving it the discretion to establish water quality standards independently of state standards. (Shelnut-Florida)
W72-01068

WATER QUALITY ENHANCEMENT AWARDS.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol. 36, No. 137, p. 13217-13218 (July 1971). 2 p.

Descriptors: *Federal government, *Pollution abatement, *Waste treatment, *Water quality, Local governments, Industries, Non-structural alternatives, Administrative agencies, Water pollution control, Social aspects, Industrial wastes, Municipal wastes, Treatment facilities, Standards, Environmental sanitation.
Identifiers: *Water Pollution Control Act.

These proposed regulations are for the purpose, as authorized by the Federal Water Pollution Control Act, of providing official recognition to those industrial organizations and political subdivisions of states which demonstrated during the preceding year an outstanding technological achievement or an innovative process, method, or device in their waste treatment and pollution abatement programs. The Administrator of the Environmental Protection Agency may award certificates of suitable design, to be known as the Water Quality Enhancement Award, to those selected by the Honor Award Board. Prior to consideration by the Board, all applications for the Award must be reviewed by the Regional Administrator of the Environmental Protection Agency. The Regional Administrator shall consider: (1) the candidate's technological achievement or process, (2) the candidates, total compliance with all applicable water quality standards, (3) the candidate's record with respect to environmental quality, and (4) the example and leadership provided by the candidate to others for environmental protection and enhancement. (Johnson-Florida)
W72-01069

A BILL TO REQUIRE THAT VESSELS COMPLY WITH STANDARDS OF WASTE DISPOSAL PRESCRIBED BY THE SECRETARY OF TRANSPORTATION.
For primary bibliographic entry see Field 05G.
W72-01070

WATER QUALITY IMPROVEMENT ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, RELATING TO THE CONSTRUCTION OF WASTE TREATMENT WORKS, AND TO THE CONDUCT OF WATER POLLUTION CONTROL RESEARCH).

House Bill 15907, 90th Congress, 2d Session (1968). 17 p.

Descriptors: *Water quality control, *Contracts, *State governments, *Government finance, Local governments, Estuaries, Research and development, Administrative agencies, Water quality, Water pollution, Water pollution treatment, Waste water (Pollution), Treatment facilities, Water treatment, Financing, Pollution abatement.

The Federal Water Pollution Control Act (FWPCA) would be amended by this House bill. The amendment would permit the Secretary to enter into contracts with interstate, state, or municipal agencies (not to exceed 30 years) to cover the federal share of principal and interest payments for treatment works meeting federal requirements, and to reduce interest on the non-federal share of the cost commensurate with comparable United States obligations. Moreover, the Secretary would be permitted to guarantee payments by local agencies for construction of treatment works. To be eligible under the Act, treatment works would have to: (1) serve a population of 125,000 or a statistical area, (2) be included in a comprehensive water quality control plan under the Act, (3) be operated in a financially responsible manner, and (4) be approved by the State agency. Conditions for the contracts are that the plants must be designed for maximum efficiency and the state must plan to improve the efficiency of all treatment plants, and begin an operator certificate program. A comprehensive estuaries study program and research, training, investigation, demonstrations and information would also be created by the Act. (Hart-Florida)
W72-01071

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO CONTROL POLLUTION FROM VESSELS WITHIN THE NAVIGABLE WATERS OF THE UNITED STATES.
House Bill 13923, 90th Cong, 1st Sess. (1967). 11 p.

Descriptors: *United States, *Ships, *Navigable waters, *Waste disposal, Legislation, Legal aspects, Water pollution, Water pollution control, Federal government, Standards, Regulation, Administration, Administrative agencies, Oceans, Water pollution sources, Sewage disposal.

Legislation amending the Federal Water Pollution Control Act was introduced to control pollution from vessels within United States' navigable waters and within a zone of the high seas contiguous to the nation's territorial sea. The bill provides that the Secretary of the Army shall prescribe regulations establishing standards for the control of sewage discharge in such waters. The content of such regulations is specified. Exemption of certain classes of vessels for appropriate periods of time is allowed. Manufacturers of devices designed to control sewage discharge from vessels may request the Secretary to issue a certificate of conformance for such devices. The Secretary, however, may require the manufacturer to perform specific tests and to make the results available to him. Upon conviction, any person knowingly violating this act, any regulation, or any condition of a certificate shall be punishable by a fine or by imprisonment. Any vessel violating such provisions shall be liable for a penalty. To enforce the act, the Secretary is authorized to board and inspect, with certain exceptions, any vessel within navigable waters and with or without a warrant arrest any violator. Similar provisions are established to control pollution from vessels within a specified zone of the high seas. (Shelnut-Florida)
W72-01072

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO STRENGTHEN AND IMPROVE AUTHORITY TO ENFORCE ABATEMENT OF POLLUTION, TO PROVIDE FOR FILING OF NOTICE WITH RESPECT TO DISCHARGE OF MATTER INTO INTERSTATE OR NAV IGABLE WATERS AND TO REQUIRE PERMITS TO REGULATE SUCH DISCHARGE OF MATTER.
House Bill 494, 90th Congress, 1st Session, (1967). 11 p.

Descriptors: *Water pollution control, *Federal government, *State governments, *Interstate waters, Administrative agencies, Water pollution, Water pollution treatment, Pollution abatement, Water quality, Water quality control, Legislation, Legal aspects, Permits, Foreign countries, Public health, Administrative decisions, Remedies.

Section 10 of the Federal Water Pollution Control Act would be amended by this House bill to protect interstate waters, rather than interstate or navigable waters. A federal-state conference would not be called where pollution is intra-state only, unless inability to market shellfish in interstate commerce results. Where pollution endangers the health and welfare of persons in a foreign country and the Secretary of State requests the Secretary to abate the pollution, a conference would be called between the state and foreign nation involved. If imminent danger to health or welfare of persons or natural resources may result from pollution, the Secretary could request the Attorney General to seek relief. Concerning hearings, the Secretary could compel the appearance and testimony of witnesses, but trade secrets would not be required to be divulged. Moreover, where a polluter did not take timely proper abatement action, the Secretary could request action by the Attorney General. A proposed new section would require notification of the Secretary of discharges in interstate waters, and would require a permit for the discharge. Furthermore, the bill would enable any citizen whose health or welfare is injured by pollution to sue in federal court without meeting amount in controversy, situs, or legal status requirements. (Hart-Florida)
W72-01073

CLEAN RIVERS RESTORATION ACT OF 1966 (A BILL TO PROVIDE A PROGRAM OF POLLUTION CONTROL AND ABATEMENT IN SELECTED RIVER BASINS OF THE UNITED STATES THROUGH COMPREHENSIVE PLANNING AND FINANCIAL ASSISTANCE, TO AMEND THE F EDERAL WATER POLLUTION CONTROL ACT.
House Bill 13104, 89th Congress, 2d Session (1966). 31 p.

Descriptors: *River basins, *Water pollution control, *Government finance, *Planning, Pollution abatement, Grants, State governments, Cities, Administrative agencies, Waste treatment, Sewage, Industrial wastes, Water utilization, Water users, Treatment facilities, Construction costs, Water treatment, Water reuse, Water quality, Standards, Water resource development, Jurisdiction, Inspection, Adjudication procedure, Regulation.
Identifiers: *Federal Water Pollution Control Act.

Title 1 provides for: (1) the development of comprehensive pollution control and abatement plans for all or part of selected river basins; (2) economic incentives for water users to conserve waters and minimize wastes; (3) the creation of a permanent organization to regulate and enforce the program; (4) local and interstate bodies to assume full financial responsibility for the construction of needed water, sewer, and waste treatment facilities; and (5) the construction of such facilities. The program will be implemented by an appointed River Basin Commission. Elements necessary for every control and abatement plan are listed and provision for administrative review by the Secretary of the Interior and other federal pollution control agencies is made. Title 11 seeks to encourage states to establish water quality standards applicable to all waters and to participate in the financing of waste treatment works. Dollar limitations for grants

under the Federal Water Pollution Control Act may be waived by the Secretary under certain conditions. Title 111 amends the FWPCA to facilitate water pollution abatement by providing adequate financial assistance for states developing and enforcing water standards and by providing the Secretary with enforcement measures similar to those in other control programs. (Rees-Florida)
W72-01074

PORTS AND WATERWAYS SAFETY ACT OF 1970 (A BILL TO PROMOTE THE SAFETY OF PORTS, HARBORS, WATERFRONT AREAS, AND NAVIGABLE WATERS OF THE UNITED STATES).

Senate Bill 3918, 91st Congress, 2d Session (1970). 5 p.

Descriptors: *Ships, *Harbors, *Transportation, *Safety factors, Water pollution control, Coastal structures, Coasts, Navigation, Shore protection, Navigable waters, Accidents, Disasters, Regulation, Federal government, Investigations, Explosives, Control, Legal aspects, Legislation, Safety.

To promote both safe maritime transportation and the safety and environmental quality of the ports, harbors, and navigable waters of the United States, the Secretary of the Department in which the Coast Guard is operating would be authorized to prescribe standards, procedures, regulations, and other measures designed: (1) to prevent damage to, or the destruction of any vessel, structure or facility; and (2) to protect navigable waters, their resources and adjoining land areas. To achieve these purposes, the Secretary could: (1) prescribe marine traffic control methods; (2) direct, regulate and control the anchorage, mooring, or movement of any vessel; (3) establish loading and unloading procedures including emergency removal of explosives and other dangerous articles; (4) prescribe minimum equipment requirements to assure adequate protection from fire, explosion and other disasters; (5) establish safety zones to regulate access to vessels, structures and waterfront facilities; and (6) establish inspection procedures to assure compliance. The Secretary would be further authorized to investigate any accident or willful or negligent act involving the loss, destruction of damage to any facility subject to this act. (Gallagher-Florida)
W72-01075

OFFSHORE PRODUCTION SAFETY ACT OF 1970 (A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF FURTHER POLLUTION BY OIL DISCHARGES FROM FEDERAL LANDS OFF THE COAST OF CALIFORNIA).
Senate Bill 4429, 91st Congress, 2d Session (1970). 9 p.

Descriptors: *United States, *Offshore platforms, *Environmental engineering, *Leases, *Legislation, Federal government, Well regulations, Legal aspects, Water pollution control, Non-structural alternatives, Environment, Drilling, Administrative agencies, Regulation, Oil wells, Water pollution sources, Costs, Government finance, Rent, Research and development, Resource development.

This Bill would provide for the suspension of all drilling on the leases listed and issued pursuant to the Outer Continental Shelf Lands Act in the Santa Barbara Channel, off the coast of California. The suspension would be effective until the Secretary of the Interior found that drilling on the leases could be accomplished with a minimum of risk of pollution and navigation hazards. In making such a finding, the Secretary would have to insure that: (1) the geological characteristics of the formation involved make it stable enough to allow for drilling and production, (2) the optimum in pollution prevention for the specific formation is provided for, (3) the drilling and production plan minimizes the ecological hazards, and (4) the underwater completion technique is the ultimate method for a specific drilling site. Offshore drilling platforms on certain leases would have .to be adequately camouflaged to preserve esthetic values. A small percentage of lease payments would be credited to a fund established to aid the development, through research, new, improved, and safer methods of exploring, drilling, and producing oil, natural gas, and other related minerals and gases from submerged lands. The fund could also be used to establish technical advisory committees to evaluate research proposals. (Johnson-Florida)
W72-01076

ENVIRONMENTAL MONITORING REPORT ACT (A BILL AUTHORIZING AND DIRECTING THE SECRETARY OF COMMERCE TO MAKE A REPORT TO CONGRESS ON ENVIRONMENTAL SYSTEMS, BOTH NATIONAL AND INTERNATIONAL).
Senate Bill 4477, 91st Congress, 2d Session (1970). 5 p.

Descriptors: *United States, *Environmental engineering, *Monitoring, *Measurement, *Legislation, Federal government, Legal aspects, Water pollution control, Water quality, Non-structural alternatives, Environment, Administrative agencies, Data collections, Regulation, Operation and maintenance, Evaluation, Performance, Costs, Research facilities, Financing.

This Bill would declare that commerce and commercial technology has an adverse impact upon the environment and that this impact could be minimized through the use of proper environmental monitoring systems to develop a knowledge of the environmental consequences of commerce and its growth. The Secretary of Commerce would be required to transmit to the Congress a comprehensive report on environmental monitoring systems. The report would include a catalog of both existing and proposed systems, classified both by the medium in which the monitoring is performed and the phenomena that are monitored. The report on each system would include: (1) a description of the system and a list of its participants, (2) a description of the associated research facilities, (3) the costs involved and the source of funding, and (4) an evaluation of its performance and adaptability to a comprehensive network of monitoring. The report would also include an evaluation of environmental monitoring generally and recommendations for the improvement of environmental monitoring systems in the United States and internationally. The Secretary of Commerce would be authorized and directed to request the assistance of the President of the National Academy of Sciences in preparing the report. (Johnson-Florida)
W72-01077

REGIONAL WATER QUALITY ACT OF 1970 (A BILL TO PROVIDE A PROGRAM OF POLLUTION CONTROL IN SELECTED RIVER BASINS AND WATERWAYS OF THE UNITED STATES THROUGH COMPREHENSIVE PLANNING AND FINANCIAL ASSISTANCE TO MUNICIPALITIES).
House Bill 18898, 91st Congress, 2d Session (1970). 7 p.

Descriptors: *United States, *Assessments, *Treatment facilities, *Financing, *Legislation, Federal government, Watershed management, Administration, Water law, Legal aspects, Waste disposal, Water pollution control, Non-structural alternatives, Environmental effects, Ecology, Administrative agencies, Effluents, Government finance, Waste treatment, Water pollution sources, Industrial wastes, Municipal wastes.

The purpose of this Bill is to encourage the preparation and development of comprehensive pollution control plans for all or part of any river basin by permanent regional water management associations. The Bill provides for the establishment of a schedule of national effluent charges for all those substances other than domestic sewage which detract from the quality of the water for municipal, agricultural, industrial, recreational, sport, wildlife, and commercial fish uses. The basis for the specific charges shall be the relationship between the quantity and quality of the waste discharged and the resulting damage to the water quality. Revenues collected pursuant to such charges shall be deposited in a trust fund and made available for grants without further appropriation. One half of the fund shall be allocated to municipalities for construction of waste treatment facilities according to a priority schedule adopted by the Secretary of the Interior. The other half of the fund shall be allocated to regional water management associations in amounts determined by population of the area served and the urgency of need. The latter grants would be conditioned upon the association being effective in its area of jurisdiction. (Johnson-Florida)
W72-01078

A BILL TO AMEND THE ACT OF AUGUST 3, 1968 (82 STAT. 625), TO PROTECT THE ECOLOGY OF ESTUARINE AREAS BY REGULATING DUMPING OF WASTE MATERIALS, TO AUTHORIZE THE ESTABLISHMENT OF A SYSTEM OF SANCTUARIES, AND FOR OTHER PU RPOSES.
House Bill 4360, 92d Congress, 1st Session (1971). 10 p.

Descriptors: *United States, *Oceans, *Waste disposal, *Estuarine environment, *Legislation, Federal government, Water law, Legal aspects, Water pollution, Water pollution control, Environmental effects, Environment, Ecology, Jurisdiction, Permits, Law of the sea, Water rights, Administrative agencies, Sewage disposal, Water pollution sources, Waste treatment, Industrial wastes, Continental shelf, Tidal waters, Public lands.

This Bill would require all persons to secure a permit from the Environmental Protection Agency before disposing waste materials into the oceans, coastal waters, and estuarine areas of the United States or into the Great Lakes. Disposals of wastes into these waters would be permitted under conditions necessary to insure that no damage to the marine environment would occur. Specific factors to be considered before issuance of permits are listed. No permit would be issued for the disposal of: (1) radioactive wastes, (2) toxic industrial wastes, or (3) chemical and biological warfare materials. Sewage or industrial wastes would eventually have to receive tertiary treatment before being dumped. The Bill also would provide for enforcement powers, penalties, and jurisdiction over violators of the Bill. The Secretary of Commerce would be authorized to designate as marine sanctuaries those areas of the nation's tidelands, Outer Continental Shelf, seaward areas, and land and waters of the Great Lakes which he determines should be preserved or restored for their recreation, conservation, ecologic, or esthetic values. Development or waste disposal should not be authorized in any area designated or under study for designation as a marine sanctuary. (Johnson-Florida)
W72-01079

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT TO PROVIDE ADDITIONAL PROTECTION TO MARINE AND WILDLIFE ECOLOGY BY PROVIDING FOR THE ORDERLY REGULATION OF DUMPING IN THE OCEAN, COASTAL, AND OTHER WATERS OF THE U NITED STATES.
House Bill 8039, 92d Congress, 1st Session (1971). 5 p.

Descriptors: *United States, *Oceans, *Waste disposal, *Standards, *Legislation, Federal government, State governments, Water law, Legal aspects, Water pollution, Water pollution control, Environmental effects, Environment, Ecology, Ju-

risdiction, Law of the sea, Permits, Water rights, Administrative agencies, Aquatic environment, Water pollution sources, Water pollution effects, Industrial wastes, Sludge disposal, Coasts, Logging (Recording).

This Bill would provide for the establishment of standards which would apply to the deposit or discharge into the ocean, coastal, and other waters of the United States of industrial wastes, sludge, spoil, and all other materials that might be harmful to the wildlife or wildlife resources or to the ecology of these waters. The purpose of such standards would be to insure that no damage to the natural environment and ecology of these waters would result. The standards require a showing of sufficient evidence by any person before discharging such materials that they will not endanger the ecology of these waters. The standards would be adopted and enforced by all federal agencies and would be applicable to these agencies as well as to their licenses. After federal standards are established, a state may adopt only more stringent standards in the area covered. All government organizations and authorized persons discharging material into the coastal waters would be compelled to keep records of such discharges. Violations of this Bill could be restrained in the district courts of the United States and a person violating a standard would be subject to a fine of $5,000 to $10,000. (Johnson-Florida)
W72-01080

A BILL TO PROVIDE FOR A FEDERAL ECOLOGICAL PRESERVE IN A PORTION OF THE OUTER CONTINENTAL SHELF IN THE SANTA BARBARA CHANNEL AND TO PROVIDE FOR A MORATORIUM ON DRILLING OPERATIONS PENDING THE ABILITY TO CONTROL AND PREV ENT POLLUTION BY OIL DISCHARGES AND TO IMPROVE THE STATE OF THE ART WITH RESPECT TO OIL PRODUCTION.
House Bill 5617, 92d Congress, 1st Session (1971). 9 p.

Descriptors: *Oil, *Water pollution control, *Continental shelf, *Leases, Oil industry, Marine geology, Structural geology, California, Water pollution, Water pollution sources, Navigation, Oceans, Hazards, Oil fields, Exploitation, Legislation.

This bill is proposed to: (1) provide for a federal ecological preserve on the Outer Continental Shelf in the Santa Barbara Channel, (2) provide a moratorium on oil drilling operations pending control of oil discharges to prevent pollution, and (3) improve methods of oil production on these submerged lands. Thirty-nine leases issued under the Outer Continental Shelf Lands Act in the Santa Barbara Channel would be terminated, and the lessees permitted to bring an action in the Court of Claims for compensation within one year. Compensation would be paid from an account created with funds from the sale of other United States oil reserves. Oil drilling would be suspended in twenty-nine other Santa Barbara Channel leases until the Secretary of the Interior certifies to Congress that drilling can be accomplished without risk of pollution or navigational hazards, and Congress concurs in this determination. Leases suspended will be extended for the suspension term; no rental fees will be collected during the term. Three leases in the Channel may continue operation under terms necessary to prevent pollution; no further drilling platforms, however, may be erected unless necessary to prevent oil leakage. (Hart-Florida)
W72-01081

CLEAN LAKES ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED, AND FOR OTHER PURPOSES).
House Bill 7438, 92d Cong, 1st Sess. (1971). 9 p.

Descriptors: *Eutrophication, *Water pollution control, *Lakes, *Government finance, *Legislation, Legal aspects, Financing, Water pollution, Water pollution sources, Water pollution treatment, Water pollution effects, Water quality control, Water quality, Standards, Grants, Administrative agencies.

To alleviate eutrophication of small community lakes, the Clean Lakes Act of 1971 is proposed. The Administrator of the Environmental Protection Agency would be authorized to increase the grant percentage for treatment works under the Act where the works: (1) discharge into a lake, (2) are in an area where enforcible water quality standards have been approved, (3) are planned and equipped with the latest technology, and (4) discharge only treated water and provide for necessary pretreatment of industrial wastes. $150 million would be appropriated for these increased grants. The Administrator would furthermore be required to provide technical and financial assistance for approved state applications; services of federal personnel and facilities may also be provided by the Administrator. Discharges of wastes into lakes for which a grant has been provided in violation of water quality standards would be prohibited, and punishable by fine and imprisonment. Moreover, the Administrator would be authorized to seek an injunction in District Court to prevent discharges violating the water quality standards of lakes for which a grant has been furnished. (Hart-Florida)
W72-01082

A BILL TO PROHIBIT DISCHARGE OF ANY MILITARY MATERIAL OR OTHER REFUSE INTO NAVIGABLE WATERS OF THE UNITED STATES OR INTO INTERNATIONAL WATERS, AND FOR OTHER PURPOSES.
House Bill 6884, 92d Congress, 1st Sess. (1971). 3 p.

Descriptors: *Water pollution control, *Environmental effects, *Waste disposal, *Navigable waters, *Legislation, International waters, Administrative agencies, Administrative decisions, Federal government, Water pollution, Water pollution sources, Pollutants, Explosives, Radioactive waste disposal, Nuclear wastes.

Discharge of any munitions, chemical, radiological, or biological warfare agents or any other refuse matter into navigable waters of the United States or international waters would be prohibited by this bill, absent issuance by the Administrator of the Environmental Protection Agency of a certificate permitting the discharge. The Secretary of Defense would be required to inventory all material which might endanger man or the environment upon disposal, and determine the safe retention date and best method of disposal. This data would be submitted to the Administrator. Furthermore, before any additional warfare materials which would endanger man or the environment upon disposal are acquired by the Department of Defense, the safe retention date and best disposal method of such munitions would be submitted to the Administrator. (Hart-Florida)
W72-01083

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS.
House Bill 5050, 92d Cong. 1st Sess. (1971). 6 p.

Descriptors: *United States, *Environmental sanitation, *Permits, *Waste dumps, Legislation, Regulation, Legal aspects, Administrative agencies, Waste disposal, Oceans, Continental shelf, Wastes, Waste assimilation capacity, Water quality, Water pollution sources, Ships, Ecology, Aquatic environment, Federal jurisdiction, International waters, Waste disposal, Administrative decisions.

Under the provisions of this Bill, the Administrator of the Environmental Protection Agency would have control over the issuance of permits required before an owner or master of a vessel may load any waste on his vessel in a United States port, if the waste is to be discharged into ocean waters. A permit would not be issued unless the Administrator found that the waste discharge would not damage the ecology of the marine environment. In no event would a permit be issued for a discharge between the Continental Shelf and the coast of the United States. The Administrator would be authorized to designate particular ocean dumping sites. The owner or master of a vessel issued a permit would have to notify the Coast Guard and the Army Corps of Engineers of the exact location where the waste is to be discharged. Violations are punishable by fine, and a vessel would be liable in rem for any assessment. As used in the Bill, the term 'waste' means matter of any kind or description, including, but not limited to, dredge spoil; spoil waste; garbage; sewage sludge; munitions; chemicals, biological, and radiological warfare agents; radioactive materials; and industrial wastes. (Johnson-Florida)
W72-01084

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO BAN POLYPHOSPHATES IN DETERGENTS AND TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SY NTHETIC DETERGENTS).
House Bill 6180, 92d Cong. 1st Sess. (1971). 14 p.

Descriptors: *United States, *Detergetnts, *Phosphates, *Water pollution control, *Water pollution sources, Eutrophication, Legislation, Legal aspects, Regulation, Pollution abatement, Waste disposal, Standards, Public health, Inspection, Water softening, Soaps, Aquatic algae, Water pollution effects, Water quality, Chemical degradation.
Identifiers: Water Pollution Control Act.

This Bill is intended to abate and control the pollution and degradation of water caused by the continuing discharge of synthetic detergents. Research has demonstrated that polyphosphates in detergents are a major cause of water pollution, accelerating beyond control the growth of algae which interferes with the use of the water and degrades water quality. The Bill recognizes that certain nonphosphorus based ingredients perform at least as well as present polyphosphate ingredients in synthetic detergents and soaps. The Bill would make it unlawful to manufacture or import any detergent containing phosphorus after June 30, 1972. Provisions are made for the seizure and disposal of such detergents and the adjudication of alleged violations. The Secretary of the Interior would be authorized to make appropriate inspections. Standards of water eutrophication ability, biodegradibility, toxicity, and of effects on the public health and welfare would be established by the Secretary. The Secretary is also authorized to inventory existing technology and assist in the development of polyphosphate substitutes. (Johnson-Florida)
W72-01085

WATER QUALITY CONTROL BILLS,
W. H. Harsha.
Congressional Record, Vol 117, No 33, p H1477-80 (daily ed. March 11, 1971). 4 p.

Descriptors: *Government finance, *Water pollution control, *Treatment facilities, *Water pollution treatment, *Legislation, Financing, Costs, Grants, Capital, Capital supply, Projects, Water law, Legal aspects, Water pollution, Water quality, Water quality control, Pollution abatement, Standards, Sewage, Sewage disposal, Sewage treatment, Waste disposal, Waste treatment, Wastes.
Identifiers: *Water Pollution Control Act.

Four bills herein introduced are the substance of the President's water pollution control proposals. A section-by-section analysis of each bill is presented. One of the bills would amend section seven of the Federal Water Pollution Control Act relating to

state program grants. Section eight, relating to grants for the construction of treatment works and the development of capabilities for future waste treatment needs, and section ten of the Act, which concerns the establishment and enforcement of water quality standards, would also be amended. Another bill, known as the Environmental Financing Act of 1971, would assure that an inability to borrow necessary funds would not prevent any state or local public body from carrying out a waste treatment works project eligible for financial assistance. An Environmental Financing Authority would be created. It would be authorized to purchase obligations of state and local public bodies and issue its own obligations. (Robinson-Florida)
W72-01086

PRESIDENT'S ENVIRONMENTAL PROPOSALS,
R. M. Nixon.
Congressional Record, Vol 117, No 18, p S1550-69 (Daily ed. February 18, 1971). 20 p.

Descriptors: *Legislation, *Water pollution control, *Water quality control, *Environmental sanitation, Waste treatment, Government finance, Waste disposal, Grants, Permits, Standards, Treatment facilities, Construction costs, Administrative agencies, Regulation, State governments, Pollution abatement, Cities, Navigable waters, Ships, Effluents, Technology, Aircraft, Federal government.
Identifiers: *Water Pollution Control Act.

The text and a section-by-section analysis of six Presidential environmental protection proposals are herein reproduced. Three bills would amend the Federal Water Pollution Control Act. Section 7 would be amended to increase governmental grants to state and interstate water pollution control programs. Sections 5 and 6 would be amended to provide more research and development in waste treatment programs. Section 8 would be amended to provide more financial assistance to cities and states for the construction of treatment plants, including a new formula for reimbursing prefinanced federal shares. Section 10 would be amended to provide, implement, and enforce stronger water quality and effluent standards. Another proposal would provide an innovative regulatory framework to control the dumping of wastes into oceans and coastal waters. The Environmental Protection Agency would issue permits to control discharges and prohibit discharges without permits. Another proposal would establish an Environmental Financing Authority that would provide a market for revenue bonds of cities unable to generate finances to match federal financing for treatment works construction. The final proposal establishes a comprehensive noise control program to be administered by the Environmental Protection Agency. Noise emissions from aircraft will also be regulated. (Rees-Florida)
W72-01087

A BILL TO PROVIDE THE COAST GUARD WITH AUTHORITY TO CONDUCT RESEARCH AND DEVELOPMENT FOR THE PURPOSE OF DEALING WITH THE RELEASE OF HARMFUL FLUIDS CARRIED IN VESSELS.

House Bill No 9116, 90th Cong. 1st Sess. (1967). 3 p.

Descriptors: *United States, *Oil wastes, *Ships, *Long-term planning, Legislation, Legal aspects, Oil industry, Oceans, Navigable waters, Water pollution, Water pollution control, Pollutants, Military aspects, Continental Shelf, Pollution abatement, Coast Guard regulations, Planning, Oil.
Identifiers: *Oil spills.

Under provisions of this Bill, the Coast Guard would make long-range plans for the control and amelioration of any major spillage or release of oil or other solid or fluid contaminants into the high seas or navigable waters of the United States, whether occurring inside or outside of the territorial waters of the United States and however caused. The Coast Guard would develop and evaluate systems and devices to: (1) control the movement of vessels carrying oil or other contaminating fluids, (2) effect the collection and removal of oil or other contaminating fluids after they have been spilled into the high seas or navigable waters, (3) reduce the contaminating effect or influence upon the seacoast of the United States and the resources over and upon the Continental Shelf of the United States caused by a major discharge of pollutants, and (4) provide for adequate warning to any area which may be threatened with harm from the results of a major discharge of pollutants. (Shelnut-Florida)
W72-01088

MICHIGAN'S 'TRUTH IN POLLUTION' ACT 200.

Michigan Water Resources Commission, Lansing, Michigan, September 1970. 2 p.

Descriptors: *Michigan, *Water pollution control, *Financing, *Data collections, Water pollution, Water quality, Pollution abatement, Regulation, Control, Costs, Investigations, Industries, Industrial production, Industrial wastes, Administrative agencies, Waste disposal, Timing.

Michigan's water pollution control program has been strengthed by this piece of legislation in the areas of enforcement, information data collection, and financing. One section of the amendment makes voluntary agreements for pollution control enforceable in the same fashion as Commission orders, so that no time is lost when a party fails to meet the voluntary schedule. Another provision requires each industrial establishment to report the nature of its enterprise, a list of materials used, and by-products and waste products. The knowledge that a previously unknown substance is being used will allow the necessary investigation and appropriate preventive measures. The need is increasing for more extensive surveillance of waste discharges in Michigan's 36,000 miles of inland streams and thousands of lakes. A new section provides for a surveillance fee on waste discharges in Michigan. The sole purpose of the fee is to meet the cost of augmented surveillance of industrial and commercial discharges and receiving waters. The fee is based on a $50 minimum plus an additional charge based on volume and waste constituents. (Gallagher-Florida)
W72-01089

A BILL TO AUTHORIZE THE COAST GUARD TO STUDY METHODS OF PREVENTING CASUALTIES INVOLVING VESSELS CARRYING CERTAIN CONTAMINANTS, TO CONDUCT CONTINUING RESEARCH ON THE REMOVAL OF CONTAMINANTS FROM BEACHES AND WATERS, THE E XAMINATION OF ROUTES USED BY VESSELS CARRYING CERTAIN CONTAMINANTS.
House Bill 15047, 90th Congress, 2d Sess. (1968). 4 p.

Descriptors: *United States, *Ships, *Oil wastes, *Water pollution control, *Legislation, Pollutants, Oil industry, Water pollution, Water pollution sources, Pollution abatement, Waste disposal, Legal aspects, Oceans, Navigable waters, Administrative agencies, Administration.

This bill would authorize the Coast Guard to study methods of preventing casualties involving vessels carrying oil and other contaminants on the high seas or navigable waters of the United States. The study shall include the feasibility of: (1) sealanes to regulate the movement of vessels carrying contaminants in congested waters adjacent to the United States coast, (2) special navigational aids to guide vessels in bad weather and in congested areas, and (3) systems to guide vessels from shore radio installations. Additionally, the bill authorizes the Coast Guard to conduct continuing research on the removal of contaminants from beaches and waters with the least possible harm to flora and fauna. The Coast Guard shall also establish long-range plans for the control and amelioration of any major spillage of oil or other contaminants into the high seas or navigable waters. Such plans must include procedures to: (1) effect the removal of contaminants either after they have been spilled, or if, because of hazard suffered by a vessel, spillage is threatened or imminent; (2) provide adequate warning to areas threatened with harm from spillage; and (3) reduce the contaminating influence upon the seacoast and the resources of the Continental Shelf. The Environmental Science Services Administration shall examine routes to insure adequate charting. (Shelnut-Florida)
W72-01090

A BILL TO GIVE THE PRESIDENT AUTHORITY TO ALLEVIATE OR TO REMOVE THE THREAT TO NAVIGATION, SAFETY, MARINE RESOURCES, OR THE COASTAL ECONOMY POSED BY CERTAIN RELEASES OF FLUIDS OR OTHER SUBSTANCES CARRIED IN OCEANOGOIN G VESSELS.
House Bill 8006, 90th Cong, 1st Sess (1967). 2 p.

Descriptors: *United States, *Ships, *Pollution abatement, *Navigable waters, Legislation, Legal aspects, Water pollution, Water pollution control, Pollutants, Administrative agencies, Coasts, Oceans, Air pollution, Natural resources, Navigation, Economic impact, Disasters.

Legislation was introduced to give the President authority to alleviate or to remove the threat to navigation, safety, marine resources, or the coastal economy posed by certain releases of fluids or other substances carried in oceangoing vessels. The bill provides that whenever, as a result of marine disasters within or without the United States territorial waters, an oceangoing vessel shall release substantial quantities of substances which may tend to contaminate the oceans, the shoreline, or the atmosphere the Coast Guard Commandant and the Secretary of the Department of the Interior, acting jointly, shall have the power to determine whether such release poses a threat to navigation, safety, marine resources, or the coastal economy and, if such threat exists, shall so inform the President. The President may then take measures to remove or alleviate the threat. In removing the threat, the President shall have power to take necessary steps, including the destruction of the offending vessel and its cargo. Additionally, he shall immediately take steps to promote international agreements and conventions to alleviate such dangers. (Shelnut-Florida)
W72-01091

A BILL TO REQUIRE FINANCIAL RESPONSIBILITY IN THE CASE OF OWNERS AND CHARTERERS OF VESSELS CARRYING OIL OR OTHER CONTAMINANTS, AND FOR OTHER PURPOSES.
House Bill 15992, 90th Cong, 2d Sess (1968). 3 p.

Descriptors: *Legislation, *United States, *Ships, *Insurance, *Oil wastes, Oil industry, Water pollution control, Water pollution sources, Oceans, Navigable waters, Legal aspects, Regulation, Administrative agencies, Administration, Damages, Financing.

This bill would require that each owner or charterer of an American or foreign vessel carrying oil, petroleum products, or other contaminants on the high seas or navigable waters of the United States, and using any port of the United States, establish his financial responsibility to meet any liability he may incur for death or injury and damage resulting from any spillage, however caused, of oil, petroleum products, or other contaminants into the high seas or navigable waters of the United States on voyages to or from United States ports. Such financial responsibility may be established by any one of,

or a combination of, the following methods: (1) policies of insurance, (2) surety bonds, (3) qualification as a self-insurer, or (4) other evidence of financial responsibility. Any person violating this act would be subject to a civil penalty to be assessed by the Secretary of Transportation. The collector of customs at any port would refuse the clearance required under law to any vessel which does not have evidence that the provisions of this act had been met. The Secretary is also given power to prescribe such regulations as may be necessary to implement this bill upon enactment. Amendments are proposed for the Oil Pollution Act of 1924. (Shelnut-Florida)
W72-01092

CHICAGO LEADS FIGHT AGAINST PHOSPHATE POLLUTION--NOW CONGRESS MUST ACT,
House of Representatives, Washington, D.C.
R. C. Pucinski.
Congressional Record, Vol 117, No 8, p H326-29 (daily ed. February 1, 1971). 4 p.

Descriptors: *Detergents, *Water pollution control, *Phosphates, *Federal government, United States, Algal control, Standards, Legislation, Legal aspects, Water pollution, Adjudication procedure, Administrative agencies, Administration, Algae, Biodegradation, Local governments, Waste disposal, Water pollution sources, Soaps, Toxicity, Public health, Water pollution effects, Federal jurisdiction.
Identifiers: *Water Pollution Control Act.

Congressman Pucinski introduced federal legislation, amending the Federal Water Pollution Control Act, to ban polyphosphates in detergents and establish standards and programs to abate and control water pollution from synthetic detergents. Phosphates used in most detergents promote the growth of algae; the unrestricted growth of algae, by consuming available oxygen, inevitably suffocates fish and other marine life until water literally begins to die. Noting a new Chicago ordinance which bans detergents having a specific phosphorous content. Pucinski emphasized that federal legislation is essential to effectively combat water pollution. His bill, in addition to making the manufacturing and importing of detergents containing phosphorus unlawful, imposes in rem liability and allows condemnation in federal court. Adjudicatory procedures for the disposition of such detergents are detailed in the bill. The bill authorizes the Secretary of the Treasury to conduct examinations and inspections. Additionally, the Secretary must establish standards of water and eutrophication ability, biodegradability, toxicity, and of effects on public health. These standards must be met by all synthetic detergents. To accelerate the development of phosphate-free detergents the Secretary must report existing technology or substitutes and is authorized to make grants and contracts for research and development.
W72-01093

OCEAN DUMPING,
House of Representatives, Washington, D. C.
G. Gude.
Congressional Record, Vol 117, No 26, p E 1264-66 (daily ed. March 2, 1971). 3 p.

Descriptors: *Water pollution control, *Atlantic Ocean, *Waste disposal, *Water pollution effects, Clams, Sewage sludge, Oceans, Delaware, Maryland, New Jersey, Water pollution, Water quality, Water quality control, Fish, Fishkill, Commercial fish, Pollution abatement, Legislation, Legal aspects, Sewage disposal, Industrial wastes, Shellfish, Water pollution sources, Federal jurisdiction.

Dumping refuse at sea is most damaging in or near ecologically sensitive bays and estuaries. It is hoped that Congress can approve sound legislation, but citizens are already taking action. The dumping of sewage sludge and industrial wastes by the cities of Philadelphia, Camden, and Bridgeton, off Cape May, New Jersey and Rehoboth Beach, Delaware has nearly destroyed the shellfish in that area and is damaging other fish. Local citizens formed an organization, known as the Stop Ocean Dumping Association (SODA), whose immediate goal is to get these cities to dump their sewage sludge at least 100 miles off the coast. Eventually, the goal is to stop ocean dumping. Federal antipollution officials were given a demonstration in which a dredge came up with black sludge and dead clams. Hearings have been set by Senator Boggs. Residents of the affected area have been encouraged to support President Nixon's Ocean Dumping Bill which would extend American jurisdiction over ocean dumping to 12 miles and require a permit from the Environmental Protection Agency for ocean dumping. Local residents, however, want more immediate results. (Robinson-Florida)
W72-01112

A STATE APPROACH TO EFFLUENT CHARGE,
For primary bibliographic entry see Field 05G.
W72-01119

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, RED CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.
Corps of Engineers, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W72-00591

FLOOD PLAIN INFORMATION, CHEHALIS, WISHKAH AND HOQUIAM RIVERS, ABERDEEN-HOQUIAM-COSMOPOLIS, WASHINGTON.
Corps of Engineers, Seattle, Wash.
For primary bibliographic entry see Field 04A.
W72-00592

6G. Ecologic Impact of Water Development

JACKSONVILLE HARBOR, FLORIDA, (SECTION 1), NAVIGATION.
Army Engineer District, Jacksonville, Fla.

Available from National Technical Information Service as PB-199 880, $3.00 paper copy; $0.95 microfiche. Draft environmental statement, 7 Jun 71. 15 p.

Descriptors: *Harbors, *Environmental effects, *Channel improvements, *Navigation, Sedimentation, Dredging, Turbidity, Fishes, Swamps, Wildlife.
Identifiers: *Environmental surveys, *Harbor facilities, *Environmental impact statements, *Jacksonville (Florida), *Jacksonville Harbor, *Saint Johns River.

The action consists of enlarging the navigation channel in the St. Johns River from the Atlantic Ocean to the municipal terminals at Jacksonville, Duval County, Florida. The construction and maintenance of the navigation project will enhance the commerical cargo industry with a much needed navigation improvement and will provide opportunities for water-related sports. The land created by disposal operations will provide picnicking, camping, and hiking areas. Temporary displacement of surface lands now serving as a habitat for animal and plant life. Approximately 80 acres of submarginal marsh will be destroyed. There will be a temporary increase in water turbidity.
W72-00747

STOCKTON SHIP CHANNEL BANK PROTECTION, SAN FRANCISCO BAY TO STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.

Available from the National Technical Information Service as PB-199 873-D, $3.00 in paper copy, $0.95 in microfiche. Draft environmental statement, 7 Jun 71. 25 p.

Descriptors: *Environmental effects, *Channel improvements, *Flood control, *Dredging, *Bank protection, Erosion control, Levees.
Identifiers: *Environmental impact statements, *San Joaquin River, *Stockton Ship Channel.

The action consists of providing wave wash protection at selected sites along the San Joaquin River from the San Francisco Bay to Stockton, California where wave wash has resulted in critical erosion. Restoration of the levee slopes and revetment of the restored slopes will maintain the intergrity of the existing levees and protect the lands behind the levee systems. The removal of existing vegetation and loss of aesthetic, wildlife and other limited natural values at bank protection sites are losses which cannot be totally avoided, but which can be partially mitigated by planned project planting. Dredging of materials from the channel to restore levees prior to placement of bank protection will cause temporary water quality changes.
W72-00748

WATER RESOURCES PLANNING AND SOCIAL GOALS: CONCEPTUALIZATION TOWARD A NEW METHODOLOGY,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 06B.
W72-00796

MODELS FOR MULTICOMPONENT MICROBIAL ECOSYSTEMS,
Clemson Univ., S.C. Div. of Interdisciplinary Studies.
For primary bibliographic entry see Field 05G.
W72-00855

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF SPORT AND COMMERCIAL FISHERIES SUBPROJECT,
Idaho Cooperative Fishery Unit, Moscow. Fish and Game Dept.
For primary bibliographic entry see Field 06B.
W72-00875

A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS--REPORT OF HISTORY SUBPROJECT,
Idaho Univ., Moscow. Water Resources Research inst.
For primary bibliographic entry see Field 06B.
W72-00876

ENVIRONMENTAL LAW--CONSIDERATION MUST BE GIVEN TO ECOLOGICAL MATTERS IN FEDERAL AGENCY DECISIONS--ZABEL V.
For primary bibliographic entry see Field 05G.
W72-01003

07. RESOURCES DATA

7A. Network Design

INSTRUMENTATION AND OPERATION OF METEOROLOGICAL AND STREAM GAGING STATIONS ON MAYNARD CREEK,
Montana State Univ., Bozeman. Water Resources Research Center.
Theodore T. Williams.
Available from the National Technical Information Service as PB-204 114, $3.00 in paper copy, $0.95 in microfiche. Interim Report No 7, February 1967. 9 p, 8 fig, 16 tab, append. OWRR A-006-MONT (2).

Descriptors: *Instrumentation, *Stream gages, *Meteorological data, *Data acquisition, Hydrologic data, Montana, *Data collections.
Identifiers: Automated system, *Maynard Creek (Mont).

The hydrologic study of Maynard Creek watershed, located in the Bridger Mountains northeast of Bozeman, Montana, was begun in 1965 by the Montana University Joint Water Resources Research Center. A major unit of the multi-phase research investigation that was initiated was the development and installation of a centrally-located data acquisition system to facilitate the collecting and handling of data from different locations on the watershed. In order to evaluate the effectiveness and reliability of the components of the data acquisition facilities, as well as to provide information regarding the hydrology of the watershed, a series of meteorological and stream gaging stations were established on the watershed, all equipped with conventional recording instruments. These stations have been operated continuously since their installation in 1965. All data coilected to date has been reduced to digital form, and some analysis has been performed on part of the data. The purpose of this report is to describe the design, installation and operation of the 'conventional' stations. (Holje-Montana)
W72-00636

COMPUTER ANALYSIS AND OPTIMIZATION OF A CLASS OF NON-LINEAR SYSTEMS,
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
C. F. Lam.
Ph D Thesis, Clemson University, August 1970. 185 p, 27 fig, 6 tab, 98 ref. OWRR B-006-SC (2).

Descriptors: *Computer models, *Digital computers, *Optimization, *Resistance networks, *Network design, Water distribution (Applied), Mathematics, Equations.
Identifiers: *Newton-Raphson.

A computer analysis of nonlinear resistive networks was presented. A system of node equations derived from linear graph theory was generated by a digital computer. Minimal time was required for evaluation. A modified Newton-Raphson algorithm solved the set of equations. Because of the numerical method of solving the equations and the form of the system of equations, the computer program can be applied to solving various resistive networks that have elements with single-valued terminal relationships and requires less computer time. The estimation of initial values from which an iterative process will converge to a solution was investigated. With the examples tried, convergence was always obtained. Three different optimization algorithms were presented. The first treated optimizing an objective function of a set of decision variables with equality constraints which are functions of both decision and state variables. Both decision and state variables were assumed to be continuous. Except that the decision variables were discrete, the second technique was similar to the first. The third approach considered optimizing an objective function of decision and state variables, subject to inequality constraints which are functions of continuous decision and state variables. All three techniques were applied to designing water distribution systems. (Markell-Cornell)
W72-00862

COOPERATIVE INVESTIGATIONS--II. KNOWLEDGE OF SURFACE WATER QUALITY IMPORTANT TO WATER DEVELOPMENT BOARD,
Texas State Water Development Board, Austin.
For primary bibliographic entry see Field 05A.
W72-00881

7B. Data Acquisition

APPLICATIONS AND INTERPRETATIONS OF RESULTS, SECTION III OF NUCLEAR WELL LOGGING IN HYDROLOGY,
For primary bibliographic entry see Field 02F.
W72-00602

INSTRUMENTATION AND OPERATION OF METEOROLOGICAL AND STREAM GAGING STATIONS ON MAYNARD CREEK,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 07A.
W72-00636

SHIELDING PRECIPITATION GAGES FROM ADVERSE WIND EFFECTS WITH SNOW FENCES,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02B.
W72-00639

A PORTABLE UNDERWATER SUCTION DEVICE,
Bureau of Sport Fisheries and Wildlife, South Central Reservoir Investigation. Fayetteville, Ark.
L. E. Vogele, R. L. Boyer, and W. R. Heard.
Progr Fish-Cult. 33 (1): 62-63. Illus. 1971.
Identifiers: Centrarchid, Collector, Device, Egg, Portable, Suction.

An air life was developed as an underwater suction device to collect egg and larvae contents from centrarchid nests. The device, made portably by using a scuba cylinder as the source of compressed air, was operated successfully to a depth of 35 ft.--Copyright 1971, Biological Abstracts, Inc.
W72-00742

AN APPLICATION OF REFLECTED-LIGHT DIFFERENTIAL INTERFERENCE MICROSCOPY: BEACH STUDIES IN EASTERN LONG ISLAND (U.S.A.),
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-00765

FEATURES AND MEASUREMENTS OF DEEP POLAR ICE CORES OBTAINED BY VARIOUS DRILLING METHODS,
Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-00768

RADIO ECHO EXPLORATION OF THE ANTARCTIC ICE SHEET,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 02C.
W72-00772

MEASUREMENTS OF ELECTROMAGNETIC WAVE VELOCITY IN THE EAST ANTARCTIC ICE SHEET,
Wisconsin Univ., Madison. Dep. of Geology and Geophysics.
For primary bibliographic entry see Field 02C.
W72-00773

DATING OF FIRN LAYERS IN ANTARCTICA: APPLICATION TO THE DETERMINATION OF THE RATE OF SNOW ACCUMULATION,
Centre National de la Recherche Scientifique, Paris France).
For primary bibliographic entry see Field 02C.
W72-00818

A SEARCH FOR COSMIC DUST IN A LARGE COLLECTION OF PARTICULATE AND DISSOLVED MATERIAL FROM POLAR ICE,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Geology.
For primary bibliographic entry see Field 02C.
W72-00821

SELF-CONTAINED THERMAL PROBES FOR REMOTE MEASUREMENTS WITHIN AN ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-00826

LIQUID SCINTILLATION COUNTING OF CA--45 IN GEOCHEMICAL STUDIES,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02K.
W72-00830

A RAPID METHOD FOR THE ESTIMATION OF THE CARBON CONTENT OF SESTON AND PERIPHYTON,
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05A.
W72-00837

A PH-CARBON DIOXIDE METHOD FOR MEASURING AQUATIC PRIMARY PRODUCTIVITY,
Georgia Univ., Athens. Inst. of Ecology; and Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-00841

THE MEASUREMENT OF RAINFALL BY RADAR AND SATELLITES,
Council for Scientific and Industrial Research Pretoria (South Africa).
For primary bibliographic entry see Field 02B.
W72-00894

7C. Evaluation, Processing and Publication

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08C.
W72-00571

OSCILLATORY KERNEL FUNCTIONS IN LINEAR HYDROLOGIC MODELS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-00584

COMPUTERIZED SLOPE STABILITY; SLIP SURFACE DEFINED BY A POLYNOMIAL OF ANY DEGREE,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-00594

PARAMETER MEASUREMENT IN FLUVIAL MORPHOLOGY,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 02E.
W72-00604

PRELIMINARY DIGITAL MODEL STUDIES OF THE RIO ACONCAGUA VALLEY, CHILE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.

W72-00606

MATHEMATICAL MODELING OF WATER DISTRIBUTION SYSTEMS,
General Electric Company, Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 04A.
W72-00715

WATER RESOURCES DATA FOR LOUISIANA: PART 1, SURFACE WATER RECORDS: PART 2, WATER QUALITY RECORDS.
Geological Survey, Baton Rouge, La.

Available from Dist. Chief, WRD, USGS, 6554 Florida Blvd. Baton Rouge, La. Geological Survey Basic Data Report, 1971. 239 p, 2 fig, 8 ref.

Descriptors: *Hydrologic data, *Data collections, *Surface waters, *Water quality, *Louisiana, Streamflow, Stream gages, Gaging stations, Flow measurements, Lakes, Reservoirs, Chemical analysis, Sediment transport, Particle size, Sediment load.

Water-resources data for the 1970 water year for Louisiana, include records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, and records of water-quality data on the chemical and physical characteristics of surface waters. Records for a few pertinent gaging stations in bordering States are also included. The base data collected at gaging stations consist of records, of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Water-quality information is presented for chemical quality, water temperature, and fluvial sediment. Chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, specific conductance, and pH. (Woodard-USGS)
W72-00794

LOGS OF WELLS IN CAMPBELL COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
W. G. Hodson.
Wyoming Water Planning Program Report No 8, July 1971. 210 p.

Descriptors: *Water wells, *Groundwater, *Logging (Recording), *Drill holes, *Wyoming, Geology, Hydrogeology, Aquifer characteristics, Water table, Depth, Pumping, Withdrawal, Water yield, Water users.
Identifiers: *Well logs, Campbell County (Wyo).

Approximately 1,200 drillers' logs of water wells in Campbell County, Wyoming are presented. The principal sources of the logs are the U. S. Agricultural Stabilization and Conservation Service and the U.S. Soil Conservation Service at Gillette, Wyoming; the Wyoming State Engineer; well drillers; and the files of the Water Resources Division of the U. S. Geological Survey. The logs are unedited and are given in the style and wording of the driller. Most of the logs were collected from mid-1967 through 1969 as part of an investigation of the water resources of the Powder River basin and adjacent areas by the U. S. Geological Survey in cooperation with the Wyoming State Engineer. Logs on file with the State Engineer through April 1971 also are included. (Woodard-USGS)
W72-00795

A PROGRAM TO DETERMINE VARIOUS DIVERSION LOSSES,
Washington State Univ., Pullman. Water Research Center.
C. B. Milham.

Available from the National Technical Information Service as PB-204 334, $3.00 paper copy, $0.95 in microfiche. July 1971. 15 p, 2 fig, 3 tab, 8 ref. OWRR A-044-WASH (1).

Descriptors: *Diversion, Pollution abatement, Columbia River, Dams, *Computer programs, Electric power, Costs, *Dynamic programming, *Diversion losses.
Identifiers: Snake River, Brownlee Dam.

A summary is presented of work done to develop a computer program for finding the cost due to the loss of water diverted from the Snake River above Brownlee Dam. The technique of analysis was dynamic programming; the values of water recognized were power generation and pollution abatement. Losses due to a number of diversion patterns are given.
W72-00803

PLANNING FOR POLLUTION CONTROL - A CRITICAL SURVEY,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W72-00857

AN INVESTIGATION OF MIXED METHODS FOR THE SOLUTION OF SIMULTANEOUS NONLINEAR EQUATIONS,
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 06A.
W72-00859

COMPUTER ANALYSIS AND OPTIMIZATION OF A CLASS OF NON-LINEAR SYSTEMS,
Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
For primary bibliographic entry see Field 07A.
W72-00862

FIELD STUDY OF EVAPORATION: NOTES ON THE EXTRACTION AND COMPUTATION OF DATA.
Snowy Mountains Engineering Corp.
For primary bibliographic entry see Field 02D.
W72-00888

08. ENGINEERING WORKS

8A. Structures

ST. LOUIS DISTRICT BEGINS DESIGN OF ALTON LOCKS,
Army Engineer District, St. Louis, Mo.
Arthur L. Johnson.
Prepared for Annual Meeting, American Society of Civil Engineers, St. Louis, Missouri, October 18-22, 1971. 33 p, 11 fig, 5 ref.

Descriptors: *Locks, *Navigation, *Mississippi River, *Dam construction, *Structural design, Hydraulic engineering, Cofferdams, Foundation bearing tests, Levees, Model studies, River regulation, Hydraulic models, Illinois.
Identifiers: Alton (Ill).

A description of the existing locks and dam, the need for increased capacity and the questionable structural integrity of this structure are presented. The major features of the new facility, the foundation problems, construction sequence, model studies and operation are discussed in general detail. The capacity of the existing locks and dam has been exceeded and projections indicate a continually increasing traffic pattern. Also, the structure has deteriorated to the point where rehabilitation is no longer feasible; replacement to meet future needs is required. The new locks and dam will be constructed about 2 miles downstream of the existing structure. Preliminary design studies indicate a pile foundation will provide a satisfactory and economical support for the structure. Separated locks will provide for simultaneous usage and maximum capacity. Emergency closure of all gate openings will provide for protection against loss of pool in case of accidental or mechanical equipment failure. Models are to be constructed of various items to determine maximum use and efficiency. The cofferdaming sequence chosen will provide an early construction start, and also allow for full-scale pile load testing with minimum cost. Because of the immediate need to increase the capacity through this reach of the Mississippi River and the questionable structural adequacy of the existing structure, planning and construction of the replacement is being advanced as rapidly as funding will allow. (Poertner)
W72-00642

RESERVOIRS OF HYDROELECTRIC POWER PLANTS OF THE USSR (VODOKHRANILISHCHA GIDROELEKTROSTANTSIY SSSR),
For primary bibliographic entry see Field 04A.
W72-00814

8B. Hydraulics

EFFECT OF INLET GEOMETRY ON FLOW-ANGLE CHARACTERISTICS OF MINIATURE TOTAL-PRESSURE TUBES,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
T. J. Dudziniski, and L. N. Krause.
Available from National Technical Information Service, Springfield, Va. 22151-$3.00. Technical Note NASA TN D-6406, July 1971. 15 p, 11 fig, 2 tab, 4 ref.

Descriptors: *Streamflow, *Flow rates, *Flow characteristics, *Flow measurement, *Model studies, Velocity, Tubes, Conveyance structures, Pressure, Pressure measuring instruments, Analytical techniques, Reynolds number.

The effect of flow angle on the indication of miniature total-pressure tubes of simple geometry was experimentally determined. Various tip shades were investigated: square-ended tubes with circular and flattened oval openings, and circular tubes with internal bevels. Tube outside diameters ranged from 0.02 to 0.32 centimeter. The tubes were tested in air at room temperature over a Mach number range of 0.3 to 0.9 and a Reynolds number range from 500 to 80,000. The effects of flow angle are conviently expressed in terms of the angle (a) at which the error in indicated total pressure becomes 1 percent of the stream impact pressure. Generally, the beveled tubes have the greatest value of (a), (up to 27 deg), while the flattened oval tubes have the smallest (down to 12 deg). The effect of variation in Reynolds number is negligible; increasing Mach number from 0.3 to 0.9 increased (a) by about 2 deg. Increasing the intensity of stream turbulence by 20 percent decreased (a) by about 5 deg. The effect of proximity of a transverse cylindrical supporting strut is negligible if the strut is two or more strut diameters downstream from the tube tip.
W72-00596

GROUNDWATER SEEPAGE PAST SHARP AND ROUNDED CORNERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
Bruce W. Hunt, and Achi Mohamed Ishaq.
Available from National Technical Information Service as PB-203 233, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 30, (1971). 35 p, 16 fig, 5 tab, 2 ref. OWRR A-041-WASH (1).

Descriptors: Groundwater, *Seepage, Porous media, *Darcys law, *Flow, Groundwater movement, Underseepage, Piezometry.
Identifiers: Sharp corner flow, Rounded corner flow, *Groundwater seepage.

An experimental investigation was undertaken with two sand-box models to study the piezometric head distributions for groundwater seepage in the neighborhood of impervious boundaries with sharp and rounded corners. Piezometric head distributions were measured for flow which accelerated after passing a sharp corner, for flow which decelerated after passing a sharp corner, for flow which accelerated after passing a rounded corner, and for flow which decelerated after passing a rounded corner. These experimental piezometric head distributions were then compared with the theoretical piezometric head distributions calculated from Darcy's law. The results of this comparison indicate that there is better agreement between theory and experiment for flow past a rounded corner than for flow past a sharp corner and that the best agreement in either case is obtained for flow which decelerates after passing a sharp or rounded corner. In addition it was found that dimensionless piezometric head distributions were not identical for the decelerating and accelerating flows. Since Darcy's law predicts that the dimensionless piezometric head distributions should be identical, and since Reynolds numbers were less than unity for the flows past the rounded corner, it was concluded that either Darcy's law does not accurately describe seepage in regions of rapid acceleration or else experimental errors must account for the rather large disagreement between experiment and theory.
W72-00802

THREE-DIMENSIONAL STABILITY ANALYSIS OF OPEN CHANNEL FLOW OVER AN ERODIBLE BED,
Technical Univ. of Denmark, Copenhagen. Hydraulic Lab.
For primary bibliographic entry see Field 02J.
W72-00835

8C. Hydraulic Machinery

ANALOG ANALYSIS OF WATER DISTRIBUTION NETWORKS,
Xentucky Univ., Lexington. Dept. of Civil Engineering.
D. J. Wood.
ASCE Proceedings, Transportation Engineering Journal, Vol 97, No TE2, Paper 8112, p 281-290, May 1971. 6 fig, 2 tab, 17 ref, append. OWRR B-017-KY (1).

Descriptors: *Water supply, *Distribution systems, *Model studies, *Analog models, *Analog computers, Computer programs, Water distribution (Applied), Systems analysis, Mathematical models, Design flow, Pipelines, Transportation, Pumps.

A technique for solving hydraulic network flow distribution problems using a standard analog computer is presented. This method can be applied to networks which include various hydraulic components such as valves and pumps. The indirect analog simulation proposed has the advantage that only a standard analog computer is needed and not specially constructed direct analog devices. In addition, analog simulation is particularly useful for carrying out parametric studies and, therefore, is a valuable design tool. Examples are presented which illustrate the technique used for solving the flow distribution problems. Also the examples are used to compare the analog solutions to those obtained by a conventional Hardy-Cross analysis, and the analog solutions are shown to be very accurate. (Woodard-USGS)
W72-00571

MATHEMATICAL MODELING OF WATER DISTRIBUTION SYSTEMS,
General Electric Company, Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 04A.
W72-00715

PERFORMANCE OF A TWIN-WALL TRICKLE IRRIGATION HOSE,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 03F.
W72-00927

8D. Soil Mechanics

COMPUTERIZED SLOPE STABILITY; SLIP SURFACE DEFINED BY A POLYNOMIAL OF ANY DEGREE,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-00594

SAMPLE USES OF COMPUTERIZED SLOPE STABILITY SOLUTIONS,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-00595

COMMENTS ON SOME OF THE PHYSICAL CHEMICAL QUESTIONS ASSOCIATED WITH THE ANALYSIS OF WATER IN EARTH MATERIALS,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 08H.
W72-00967

AQUARIUS STUDY - ENGINEERING AND ECONOMIC CONSIDERATIONS,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 08H.
W72-00972

8E. Rock Mechanics and Geology

COMMENTS ON SOME OF THE PHYSICAL CHEMICAL QUESTIONS ASSOCIATED WITH THE ANALYSIS OF WATER IN EARTH MATERIALS,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 08H.
W72-00967

PROJECT AQUARIUS--GEOHYDROLOGIC INVESTIGATION,
Arizona Univ., Tuscon.
For primary bibliographic entry see Field 08H.
W72-00971

8F. Concrete

Brookhaven National Lab., Upton, N.Y. 06Design Studies on Multistage Flash Distillation Vessels,
For primary bibliographic entry see Field 03A.
W72-00618

WHAT'S NEW IN WATER AND SEWER PIPE,
American Society of Civil Engineers, New York.
K. A. Godfrey, Jr.
Civil Engineering, American Society of Civil Engineers, October 1970. p 46-51, 12 fig.

Descriptors: *Pipes, *Seepage, *Linings, *Sewers, Water supply, Epoxy resins, Plastics, Joints, Asbestos cement, Asphalt, *Concrete, Texas, California.
Identifiers: *Dallas (Tex), Galveston (Tex), Modesto (Calif).

Two 1,300 foot 10 inch ID drains have been emplaced using a moving form which casts the non-reinforced concrete pipe at a rate of up to 30 ft per hours. Forty-two miles of 2 inch to 6 inch PVC pipe was laid in Texas at a rate of 8 miles per day using the Badger equipment introduced to the U. S. in early 1970. In Galveston, Texas, Truss Pipe with an infiltration specification of 100 gal per in. pipe diameter per day for heads up to 10 feet is being used. The pipe is made of ABS plastic in diameters of 8 to 15 in. and sections can be bonded using a primer and cement which is paired on. A 1,600 foot run of 14 inch. polyethylene Sclair pipe has been laid to carry pulp mill wastes. Tests have shown the polyethylene has seven times more resistance to abrasion by wood chips and other materials as did the asbestos-cement pipe it replaced. Eight thousand feet of 8 and 10 in. concrete pipe is being relined with 6 and 8 in. polyethylene Uni-Pipe. This procedure is cheaper than cleaning and mechanically applying relining. Lenths of pipe are butt welded using heat with weld strengths of 80 to 120% of pipe strength. Dallas, Texas is fighting the infiltration problem, in part, by the use of PVC couplings to join pipes of different dimensions. In Modesto, California, a 5,500 foot 24 inch concrete pipe was lined with an 18 inch Techite liner jacked through the entire length of the pipe from one jacking pit. (Goessling-Texas)
W72-00903

8H. Rapid Excavation

SYMPOSIUM ON ENGINEERING WITH NUCLEAR EXPLOSIVES.
American Nuclear Society, Washington, D.C.; and Atomic Energy Commission, Washington, D.C.

Available from the National Technical Information Service as CONF 700101, Vols 1 and 2, $6.00/set, $0.95 microfiche. AEC Conference Paper CONF 700101, Vol 1 and Vol 2, Jan. 14-16, 1970, Las Vegas, Nev. 1785 p.

Descriptors: *Water yield, *Water conservation, *Water quality control, *Surface waters, *Groundwater, *Water pollution control, *Water pollution sources, *Water treatment, *Nuclear explosions, Engineering structures, Hydraulic structures, Excavation, Dams, Cost-benefit theory, Seismic studies, Arizona, California.
Identifiers: Peaceful uses, Nuclear energy, Benefit-risk, Population exposure, Legal limitations, Plowshare.

This symposium on 'Engineering with Nuclear Explosives' reports to the Plowshare community, both national and international, the progress achieved since April 1964, the date of the Third Plowshare Symposium. In structuring the technical presentations, contributions of broadest interest were placed at the beginning, thus forming a common base of current information and applied science understanding developed in support of Plowshare technology. Sessions of speciality or pertaining to specific areas of application and engineering follow logically in the program. The Plenary Session reviewed the current status of the Plowshare Program from the technical, government, and industrial points of view. The 112 papers presented at 15 technical sessions covered all technical aspects of the Plowshare Program. The conference summary reviewed principal themes, areas of significant advance, and subjects requiring further attention that emerged during the technical conference. (See also W72-00967 thru W72-00974) (Houser-NSIC)
W72-00966

COMMENTS ON SOME OF THE PHYSICAL CHEMICAL QUESTIONS ASSOCIATED WITH THE ANALYSIS OF WATER IN EARTH MATERIALS,
California Univ., Livermore. Lawrence Radiation Lab.
Edward Catalano.
Available from the National Technical Information Service as CONF 700101, Vol 1 and 2, $6.00 for two volumes; $0.95 microfiche. AEC Conference

Paper CONF-700101, Vol 1, Proceedings - Symposium on Engineering with Nuclear Explosives, Jan 14-16, 1970, Las Vegas, Nevada, p 493-504.

Descriptors: *Engineering geology, *Seismic properties, *Rock properties, *Seismology, *Nuclear explosions, *Excavation, *Earth materials, *Rock, *Analytical techniques, Water analysis, Research and development, Technology, Geochemistry, Geophysics, Soil analysis, Seismic studies.

The quantitative analysis of the water content of earth materials is of great importance in various aspects of the Plowshare Program. The requirements for water analyses encompass a wide variety of problems from predictions of the strengths of earth materials to the disposition of radioactive elements in the cavities and craters created by nuclear devices. Water analyses are also useful in areas other than Plowshare where the problems are geochemical and geophysical in nature, such as predicting seismic damage in various geological regions. A single, general method of analysis to yield pertinent information for such a wide variety of requirements does not exist, and it is doubtful that one could be found. The purpose of this report is to establish a workable set of definitions to examine the specific problem at hand and to point the way to one or more analytical methods that can yield pertinent information. The intention is to explore some of the subtleties of the questions regarding water analyses in earth materials in enough detail so that some of the commonly overlooked questions can be recognized. A few specific methods of analyses are discussed. (See also W72-00966) (Houser-NSIC)
W72-00967

REVIEW - WATER RESOURCES DEVELOPMENT,
California Univ., Berkeley.
David K. Todd.
Available from the National Technical Information Service as CONF 700101, Vol 1 and 2, $6.00 per set, $0.95 microfiche. AEC Conference Paper CONF 700101, Vol 2, p 1160-1163, January 14-18, 1970.

Descriptors: *Water resources development, *Nuclear explosions, *Construction, *Excavation, *Craters, *Environmental effects, *Biology, Ecology, Radioactivity effects, Radioecology, Population, Water pollution effects, Water pollution sources, Hazards, Legal aspects, Economic justification, Geologic investigations, Hydrologic aspects, Regulation, Air pollution.
Identifiers: Population exposure, Atmospheric pollution, Legal limitations, Critical nuclide pathway.

Possibilities of employing nuclear explosives to develop and manage water resources for the benefit of man have been studied. Experimental and theoretical studies have been undertaken. Applications have been considered including site studies for particular projects. Attention has been given to the economics of specific applications, to hazards and safety problems, to legal limitations, to geologic and hydrologic considerations, and to effects on water quality. The net result of this effort has been the development of a large body of knowledge ready to be drawn upon wherever and whenever needed. Nuclear explosives are important tools for water resources development; they must be carefully selected so as to serve their intended purpose at minimum cost with few side effects. Results of the studies indicate the following conclusions: (1) Although there are important environmental limitations, no major technical obstacles exist to the creation of properly located nuclear craters or chimneys for water resources management. (2) Nuclear craters and chimneys have potentially important applications for a variety of water resources purposes. (3) The economic feasibility of constructing nuclear craters and chimneys for water resources projects can be demonstrated in many situations. (4) More definitive information should derive with time from test detonations and related studies which are underway in fields other than water resources. (See also W72-00966) (Houser-NSIC)
W72-00968

NUCLEAR EXPLOSIVES IN WATER--RESOURCE MANAGEMENT,
Geological Survey, Washington, D.C.
Arthur M. Piper.
Available from the National Technical Information Service as CONF 700101, Vol 2, $6.00 per set, $0.95 microfiche. AEC Conference Paper CONF 700101, Vol 2, p 1164-1168, January 14-18, 1970.

Descriptors: *Nuclear explosions, *Construction, *Craters, *Excavation, *Streamflow, *Canal construction, Cost-Benefit analysis, Economic justification, Water storage, Water yield improvement, Groundwater recharge, Hydrologic aspects, Air pollution, Contamination (Air), Contamination (Water), Tritium, Legal aspects.
Identifiers: Peaceful uses, Accelerated flow, Retarc.

Nuclear explosives afford diverse tools for managing our water resources. These include principally: the rubble column of a fully contained underground detonation, the similar rubble column of a retarc, the crater by subsidence, the throwout crater of maximum volume (the latter either singly or in-line), and the ejecta of a valley-slope crater. By these tools, one can create space in which to store water, either underground or on the land surface--in the latter instance, to a considerable degree independently of the topography. Underground, one can accelerate movement of water by breaching a confining bed, a partition of a compartmented aquifer, or some other obstruction in the natural 'plumbing system.' Finally, on the land surface, one can modify the natural pattern of water flow, by canals excavated with in-line detonation. In all these applications, the potential advantage of a nuclear explosive rests chiefly in undertakings of large scale, under a consequent small cost per unit of mechanical work accomplished. Increased water storage and movement underground also have some practical limitations which are disclosed. (See also W72-00966) (Houser-NSIC)
W72-00969

PROJECT AQUARIUS - CONTROL OF RADIOISOTOPES AND SAFETY,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
Roy G. Post.
Available from the National Technical Information Service as CONF 700101, Vol 2, $6.00/set, $0.95 microfiche. AEC Conference Paper CONF 700101, Vol 2, p 1169-1173, Jan 14-18, 1970.

Descriptors: *Nuclear explosions, *Structural engineering, *Structural geology, Structures, *Water yield, *Water yield improvement, Water pollution, Water pollution sources, Pollution abatement, Water resources, Hydrologic aspects, Engineering geology, Radioisotopes, Public health, Toxicity, Benefits, Arizona.
Identifiers: Arizona Atomic Energy Commission, Benefit-Risk.

The potential application of nuclear explosives to the development of water resources provides real hope for substantial increases in the availability of water from our natural water supplies. A wide range, exploratory project sponsored by the United States Atomic Energy Commission, the Bureau of Reclamation, the Arizona Atomic Energy Commission, and The University of Arizona was conducted by the Hydrology and Water Resources Office, the Department of Nuclear Engineering, and various state and federal governmental agencies in exploring the potential applications of nuclear explosives for developing water resources in the State of Arizona. The primary objective of the project was of a scouting nature, a reconnaissance effort to assess the potential for Arizona. This work, Project Aquarius, is at an early state and any significant conclusions are certainly premature. Since this is a survey, detailed analyses are not justified. Our purpose is to define limiting problems and estimate our ability to solve them. We do not seek to formulate a detailed solution until the project has been defined better. In addition to the technological aspects of the project, it is suggested that a strong public relations program is advisable. (See also W72-00966) (Houser-NSIC)
W72-00970

PROJECT AQUARIUS--GEOHYDROLOGIC INVESTIGATION,
Arizona Univ., Tuscon.
William J. Ganus.
Available from the National Technical Information Service as CONF 700101, Vol 2, $6.00/set, $0.95 microfiche. AEC Conference Paper, CONF. 700101, Vol 2, p 1174-1183, Jan 14-18, 1970.

Descriptors: *Nuclear explosions, *Hydrogeology, *Water storage, *Watersheds (Basins), *Dam construction, *Rock mechanics, Surface runoff, Surface drainage, Rainfall-runoff relationships, Surface waters, Watershed management, Aquifers, Groundwater, Radioisotopes, Water pollution, Water pollution sources, Arizona, Rock fill, Landslides.

A general discussion of geological and hydrologic conditions for a canyon site in North-central Arizona is given. Groundwater recharge by cratering in alluvial materials is rated as the second most favorable application and a site in South-eastern Arizona is discussed. Other applications are presented but hold less promise due to lack of geohydrologic and nuclear explosion data necessary for proper evaluation. Primary consideration was given to distance of site from population centers and to the quantity of water that could be developed and managed. For surface water resource development by nuclear explosions, additional considerations for site selection included canyon shape for landslide, throw-out or rock-fill techniques, canyon meanders necessary for diversion channels, low permeable rock types for minimizing problems of radioisotope migration, and a clear identification of any groundwater system that could be affected. In the site selection for recharge craters, considerations included adequate subsurface storage space, aquifer characteristics favorable to recharge and recovery, subsurface lithologic type and distribution that would permit control of radioisotopes by either monitoring or removal, suspended sediment load of water source, and estimated increased efficiency of artificial recharge over natural recharge. (See also W72-00966) (Houser-NSIC)
W72-00971

AQUARIUS STUDY - ENGINEERING AND ECONOMIC CONSIDERATIONS,
Bechtel Corp., San Francisco, Calif.
Roger F. Griffin.
Available from the National Technical Information Service as CONF 700101, Vol 2, $6.00 per set, $0.95 microfiche. AEC Conference Paper, CONF 700101, Vol 2, p 1184-1197, January 14-18, 1970.

Descriptors: *Construction costs, *Nuclear explosions, *Structural engineering, *Structural geology, *Structures, Rockfill dams, Damsites, Locations, Topography, Air pollution, Soil contamination, Water pollution, Water pollution sources, Seismology, Tritium.
Identifiers: Nuclear quarrying, Throwout Dam, Retarc Dam.

Surface storage behind a dam created with the use of nuclear explosives was selected for the major effort, primarily because it could afford the most valid direct comparison between nuclear and conventional methods. This paper will focus on the engineering and economic considerations involved in developing and evaluating three concepts for constructing a rockfill dam using nuclear explosives. Engineering development and economic evaluation of the concepts was the principal responsibility of

Bechtel Corporation as a consultant in the study to the Arizona Atomic Energy Commission. We depended heavily on information supplied by the Federal participants, notably the U.S. Bureau of Reclamation for site data and the U.S. AEC's Lawrence Radiation Laboratory for information on nuclear explosives effects. Since the study report has not yet been published and additional material is still forthcoming, some of the information presented such as the cost estimates, may be subject to change and should be considered preliminary. (See also W72-00966) (Houser-NSIC)
W72-00972

THE USE OF A RUBBLE CHIMNEY FOR DENITRIFICATION OF IRRIGATION RETURN WATERS,
Stanford Univ., Palo Alto, Calif.
Roy B. Evans, and Paul Kruger.
Available from the National Technical Information Service as CONF 700101, Vol 2, $6.00/set, $0.95 microfiche. AEC Conference Paper, CONF 700101, Vol 2, p 1222-1245, Jan 14-18, 1970.

Descriptors: *Nuclear explosion, *Filters, *Diatomaceous earth, *Porous media, *Waste water treatment, *Denitrification, *Nitrates, Eutrophication, Irrigation water, Aquatic algae, Biological properties, Water pollution effect, Water pollution sources, Cost comparisons, Beneficial use, Water quality, California, Biocontrol, Cost-benefit theory.
Identifiers: Rubble Chimney, San Joaquin Valley.

The use of water for irrigation seriously reduces the quality of the water. Irrigation return water may have high concentrations of salts, pesticides, and plant nutrients, and discharge of the return flows into rivers or other receiving waters can seriously affect the quality of the receiving waters. The increased availability of cheap fertilizers has had the undesirable side-effect of increasing concentrations of nitrogen and phosphorus in irrigation return flows. The presence of these elements can be troublesome. Both are nutrients necessary for the growth of algae, and in some situations their presence may result in severe algal blooms in the receiving waters. Their removal from waste water is considered difficult and expensive. Biological denitrification has been proposed as a means of removing nitrates from waste waters to control eutrophication in receiving waters. A potential use for this method is the treatment of irrigation return waters containing high concentrations of nitrate-nitrogen, since direct discharge of such wastes may cause objectionable algal growth in the receiving waters. For example, the process may be used to treat agricultural waste waters in the San Joaquin Valley in California, where an estimated 580,000 acre-feet/year of return waters, containing 20 mg/l of nitrate-nitrogen, will require disposal by A.D. 2020. This paper presents the results of a preliminary investigation of the feasibility of using a rubble chimney as a biological filter for denitrification. (See also W72-00966) (Houser-NSIC)
W72-00974

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

A SUMMARY REPORT, 1965-1971.
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 09D.
W72-00758

9D. Grants, Contracts, and Research Act Allotments

A SUMMARY REPORT, 1965-1971.
Texas A and M Univ., College Station. Water Resources Inst.

Available from the National Technical Information Service as PB-204 117, $3.00 in paper copy, $0.95 in microfiche. Texas Water Resources Institute Summary Report, June 1971. 74 p. OWRR Project A-999-TEX (3).

Descriptors: *Water resources development, *Reviews, *Texas surface waters, Groundwater, Water conservation, Water quality, Economic impact, Ecology, Recreation, Projects, Education, Training.
Identifiers: *Water resources summary report (Texas).

Information is presented on the accomplishments of the Texas Water Resources Institute from its initiation to June 1971. The Institute was reorganized in 1964 when the name was changed from the Water Research and Information Center to the Water Resources Institute. The scope of the Institute program was broadened so that the organization could better serve the water research needs of Texas and complement the graduate and undergraduate academic programs in fields related to water resources at Texas A and M University. The Institute's objectives and the research, training, and public service programs designed to accomplish these objectives are summarized under the following categories: (1) Water Resources Planning, (2) Water Conservation, (3) Water quality, (4) Economic Impact, (5) Ecology, (6) Recreation and Esthetics, (7) Water Resources Information Services, (8) Projects, and (9) Education and Training. (Woodard-USGS)
W72-00758

10. SCIENTIFIC AND TECHNICAL INFORMATION

A SUMMARY REPORT, 1965-1971.
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 09D.
W72-00758

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
Rose T. Pfund, and Dorothy L. Steller.
Available from National Technical Information Service as PB-204 234, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 50, July 1971. 142 p. OWRR A-024-HI (1).

Descriptors: Water resources, *Bibliographies, *Hawaii, *Publications, Documentation.
Identifiers: KWIC index.

This bibliography is a comprehensive compilation of approximately 1,500 publications of studies on water resources of the Hawaiian Islands up to the Year 1966 collated by the IBM KWIC (keyword in context) program.
W72-00805

BOTTOM DEPOSITS,
For primary bibliographic entry see Field 05C.
W72-00847

CONCEPTS OF COAGULATION,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 05D.
W72-00905

BIOLOGICAL CONCENTRATION AND TURNOVER OF RADIONUCLIDES IN FOOD CHAINS: A BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn. Ecological Sciences Div.
For primary bibliographic entry see Field 05C.
W72-00977

INDEXED BIBLIOGRAPHY ON EFFECTS OF RADIONUCLIDES AND IONIZING RADIATION ON ECOLOGICAL SYSTEMS,
Oak Ridge National Lab, Tenn. Nuclear Safety Information Center.
For primary bibliographic entry see Field 05C.
W72-00978

LIVESTOCK WASTES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-00988

THE QUEST FOR ENVIRONMENTAL QUALITY: FEDERAL AND STATE ACTION, 1969-70.
Advisory Commission on Intergovernmental Relations, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-01052

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Upper Trinity River Basin Comprehensive Sewerage Plan, Volume II.
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Pollution of Waters of State by Oil.
W72-01039 6E

Mississippi Air and Water Pollution Control Act.
W72-01061 5G

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Chillisquaque Creek Watershed Ass'n v. Sanitary Water Bd. (Administrative Discretion in Granting Permits for Waste Discharges).
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A. Center of Competence		
University of Wisconsin, Eutrophication	W72-00837--00838 00840--00851 01094--01110	31
U.S. Geological Survey, Hydrology	W72-00573--00574 00576--00584 00586--00612 00758--00789 00791--00792 00794--00795 00806--00809 00812--00830 00833--00836 00571	103
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AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W72-00939--00972 00974--00978	39
University of Wisconsin, Water Resources Economics	W72-00863--00864 00866--00873	10
Iowa State University, Agricultural Livestock Wastes	W72-00979--00994	16
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B. State Water Resources Research Institutes		
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Washington Water Research Center	W72-00797--00803	7

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B. State Water Resources Research Institutes (Cont'd)		
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Engineering Aspects of Urban Water Resources (Poertner)	W72-00640--00649	10
Office of Water Resources Research	W72-00715, 00796 00804	3

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public Work Supply Treatment Technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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